Part III: Surface Water Assessment and Program Update

Part III: Surface Water Assessments and Program Updates

Chapter 1 Spatial Extent and Comprehensive Assessment

The U.S. Environmental Protection Agency (EPA) guidance (USEPA 2002) recommends that each assessment of collected sampling data be applied to a waterbody with a specific spatial extent (e.g., stream miles, lake, estuary and ocean acres). Additionally, the National Academy of Sciences published a report to Congress that addressed the need for improved scientific basis for assessments completed by states for the 305(b) and 303(d) reports. In response, NJDEP revised and improved its assessment methods including the development of a new method to determine spatial extent of monitoring networks. Spatial assessment methods were first developed in the late 1990's that estimated the stream miles associated with each monitoring site, however, the methods had many limitations and the need for an improved scientific-based approach was clear.

Prior to the 2002 Integrated Report, the Department made two attempts to determine the spatial extent of assessed river reaches. Both of these efforts aimed to create simple, easy to apply methods due to limited personnel staffing and resources. The first approach assumed each sampling site represented 5 river miles, 2.5 miles upstream and 2.5 miles downstream of the monitoring site. This method was derived from EPA 305b guidance, but lacked any scientific basis in determining the spatial extent. Although this approach was easy to apply, the most obvious shortcoming was that each monitoring site was treated as the same when environmental conditions were unique to each site. The consequences included overestimating the spatial extent of aquatic life sites, and underestimating the spatial extent of chemical monitoring sites on larger rivers. Many aquatic life sites were overestimated by overlapping assessment areas caused by sites being located within 3 miles of each other. On the other hand, chemical sites were underestimated on larger rivers such as the Passaic and Raritan Rivers where sites represent river stretches longer than 5 miles. Additionally, no tributaries were associated with the sampling site although conditions could be similar.

To treat each site as having unique environmental conditions, the next spatial extent approach assigned each sampling site to the river segment in which it was located. These river segments were assigned using USEPA's Reach File 3 (RF3) hydrological map, a 1:100,000 hydrology Geographic Information System (GIS) coverage of the state. The delineation of the RF3 river segments is based on a change in hydrology such as a river confluence, a water impoundment (lake), or other significant hydrological change. The limitation to this approach was that the assessment length was very short for the monitoring sites. Many of the spatial extents were less than one mile and seemed to underestimate the assessment length for the majority of sites. The reason for the short segments was that very small tributaries (1st or 2nd order streams) were causing stream segments to be very short in many areas, although their impact on the mainstem could be negligible. In addition, tributaries were not associated with the sampling site as in the previous spatial extent method. The consequences resulted in only 176 of 7,800 river miles were assessed for chemical sites, while over $1 million was spent on collecting data from the network.

The goal in developing the new spatial extent approach was to improve estimates of assigning waterbodies to monitoring stations by maximizing the use of monitoring data without overestimating spatial extent. The approach overcomed the limitations of the previous attempts to determine assessment lengths by extending the size of the RF3 segments, avoiding the shortfalls of assigning a fixed assessment area for each site, including tributaries with similar

water quality conditions, while at the same time, preventing overestimating the spatial length of the assessments. The new method to estimate the spatial extent for each monitoring site in the NJDEP's biological and chemical networks is also applicable to other monitoring stations where data is collected. In addition to developing spatial extents for rivers, the Department applied new methods to determine spatial extent for lakes, estuaries, and ocean areas. See the Methods Document, Section 6, for the procedures to determine spatial extents.

The results of the new spatial extent method showed a total of 3,625 non-tidal river miles were assessed accounting for 55% of the total non-tidal river miles in the state (See Figure 1-1). The remaining 45% of the river miles had no data collected at their locations or were not assessed for this report. Of the assessed rivers, 2,463 miles were assessed for aquatic life, 2,308 miles were assessed for chemicals and metals, and 376 miles posted fish advisories. In tidal areas, a total of 1,165 river miles were assessed accounting for 77% of tidal rivers, and 100% of estuaries, bays, and ocean waters were assessed for at least one designated use (See Figure 1-2). The tidal river assessments consisted of: 887 miles for shellfish, 166 miles for chemicals and metals, 55 miles for aquatic life, and 330 miles of fish advisories. Meanwhile, coastal waters were assessed for shellfish (1,053 sq mi), aquatic life (712 sq mi), recreation (714 sq mi), fish advisories (615 sq mi), and metals (75 sq mi). The assessment of lakes had the lowest comprehensive coverage of all the waterbodies. Only 371 of 3,278 lakes larger than 2 acres were assessed (See Figure 1-3). This accounted for only 11% of the lakes in the state and included the following designated use assessments: 319 lakes for recreation, 117 lakes for trophic status, 41 lakes for aquatic life, and 41 lakes for fish advisories.

As mentioned in the "Methods Document", evaluated waters are categorized into two types:

- **Monitored Waters**: assessment results applied to a waterbody based on monitoring site data using the hydrologic method for estimating spatial extent (discussed in Section 6). Given the high degree of confidence in these results for monitored waters, they will be used to place a waterbody in Sublists 1 through 5.

- **Estimated Waters**: assessment results extrapolated from adjacent monitored waters using the hydrologic method for estimating spatial extent (discussed in Section 6). Extrapolations will be based on land use, possible pollution sources, and best professional judgement. Given the lower degree of confidence in these results for estimated waters, they will only be used to place a waterbody in Sublist 3.

A total of 490 non-tidal river miles (21% of chemical assessments) were estimated based on chemical monitoring stations, while only 128 non-tidal river miles (5% of aquatic life assessments) were estimated for aquatic life monitoring stations. No tidal rivers, lakes, estuaries, or ocean waters were estimated for any designated uses.

FIGURE 1-1. Assessed River Reaches. Includes monitored and estimated rivers.

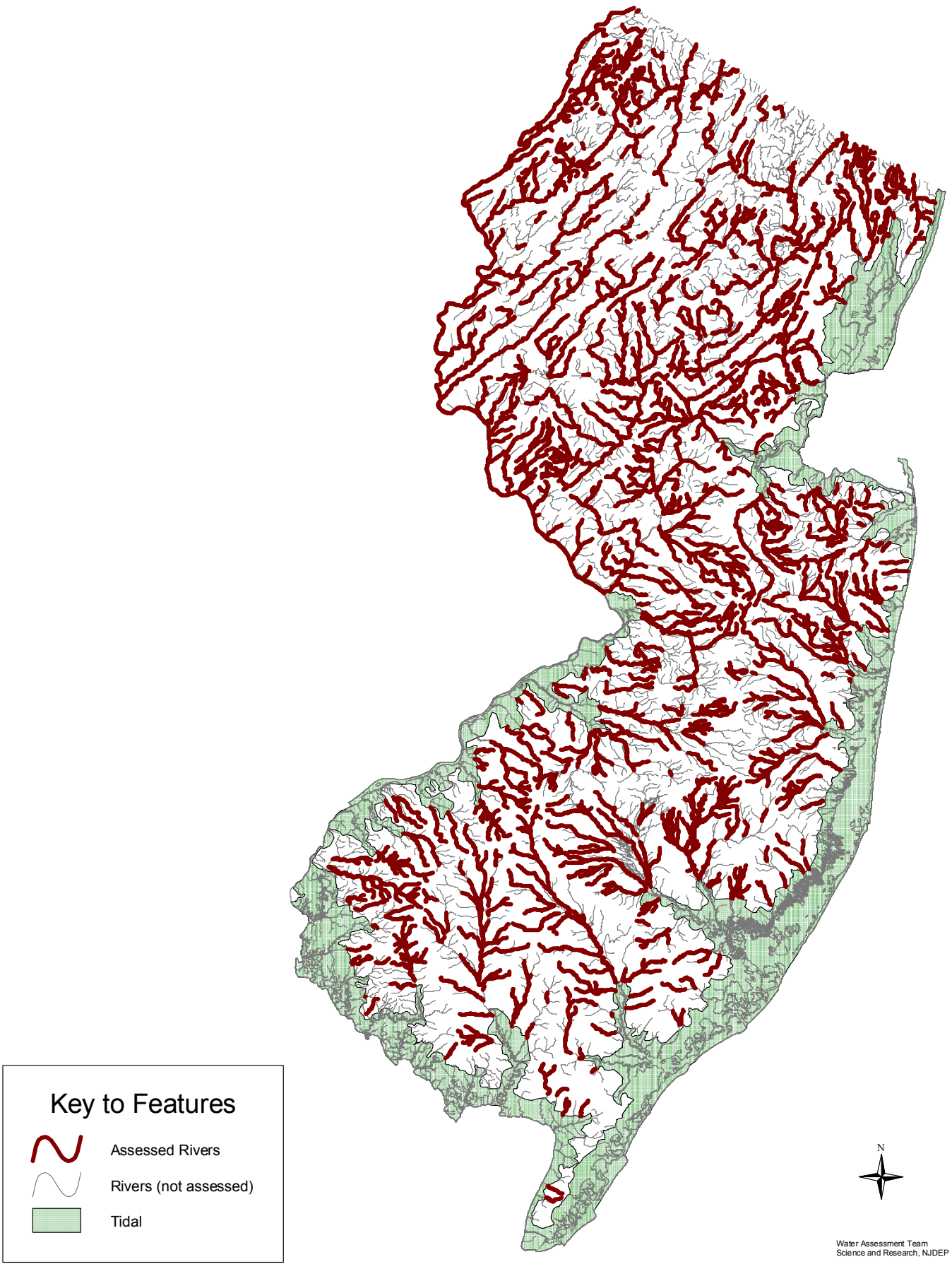


FIGURE 1-2. Assessed Tidal Rivers and Coastal Waters.

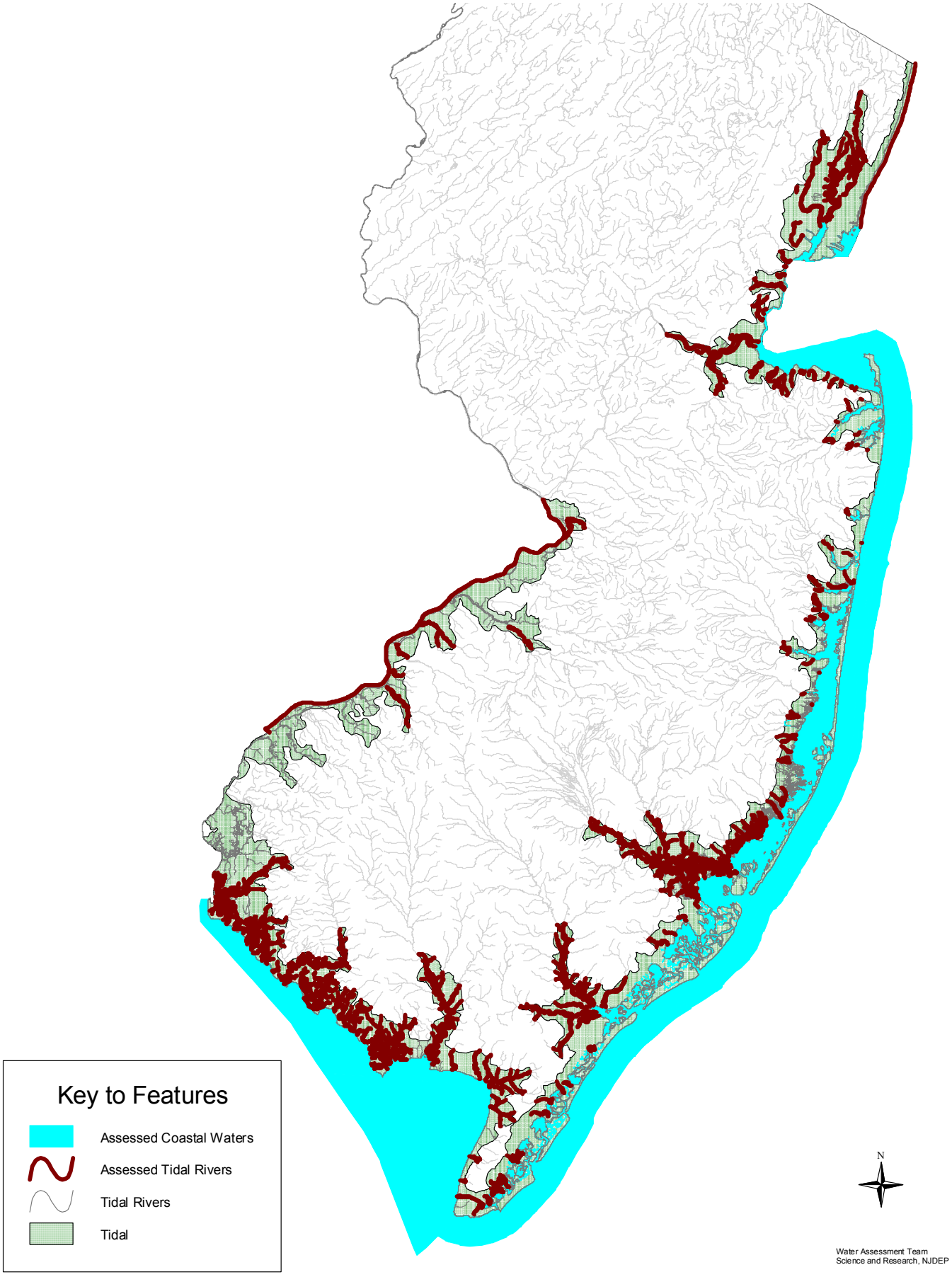
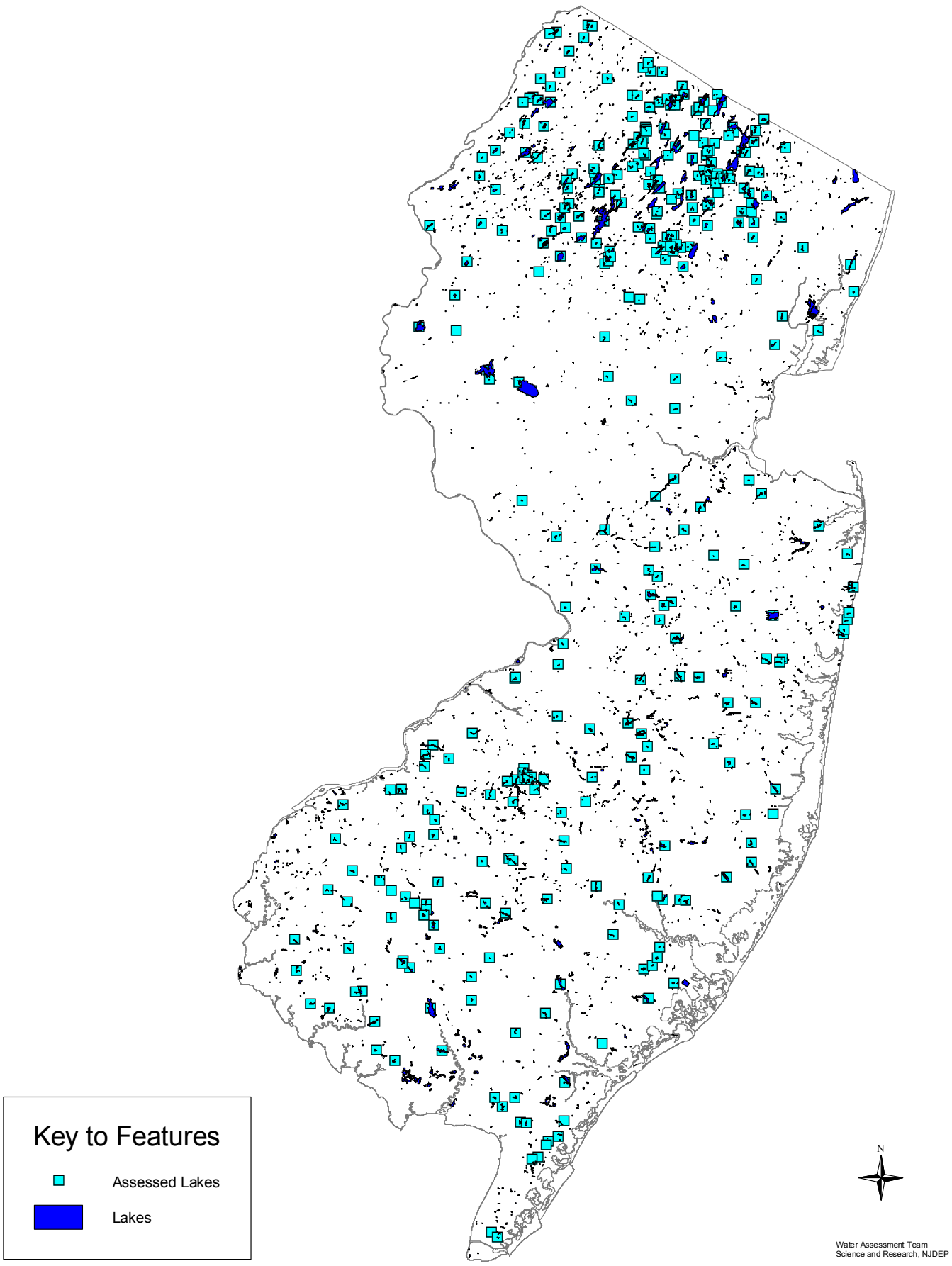


FIGURE 1-3. Assessed Lakes.



Chapter 2: Chemical Water Quality Assessment

Section 2.1 Non-Tidal Rivers

There are 7,840 miles of rivers and streams in addition to 675 miles of canals in New Jersey. Of these, 6,330 miles (81%) are non-tidal rivers, 1,520 miles (19%) are tidal rivers, and 197 river miles share a border with a neighboring state. New Jersey's rivers are used for multiple purposes such as water supplies for drinking water, industry and agriculture, trout and warm-water fisheries, aquatic resources, recreation (e.g., boating, swimming), and wastewater disposal. The characterization that follows describes water quality in freshwater, non-tidal rivers. The assessments are based on water quality status and trends with respect to Surface Water Quality Standards (SWQS), and attainment of designated uses for recreation, drinking water, agriculture, and industry.

Approximately 430 stations representing 2,308 river miles were assessed for at least one of the following parameters; total phosphorus, pH, dissolved oxygen, temperature, fecal coliform, nitrate, total suspended solids, total dissolved solids, unionized ammonia, and metals. Of the 2,308 assessed river miles, 1,913 river miles did not meet the SWQS for at least one parameter. As Figure 2.1-1 shows, the chemical parameters of most concern in the state are fecal coliform, total phosphorus, pH, and metals. The Department is addressing these issues primarily through Total Maximum Daily Load (TMDL) development, and has selected fecal coliform, which comprises over 35% of all chemical exceedances, as the priority for TMDL implementation. Total phosphorus also continues to be a major concern and will be addressed through a combination of permitting strategies and TMDL development. For pH, the exceedances may not be as significant as the figure demonstrates and is explained in the pH Water Characterization Section. The Department, along with EPA, continues to sample metals data and will plan future courses of action when all data is evaluated.

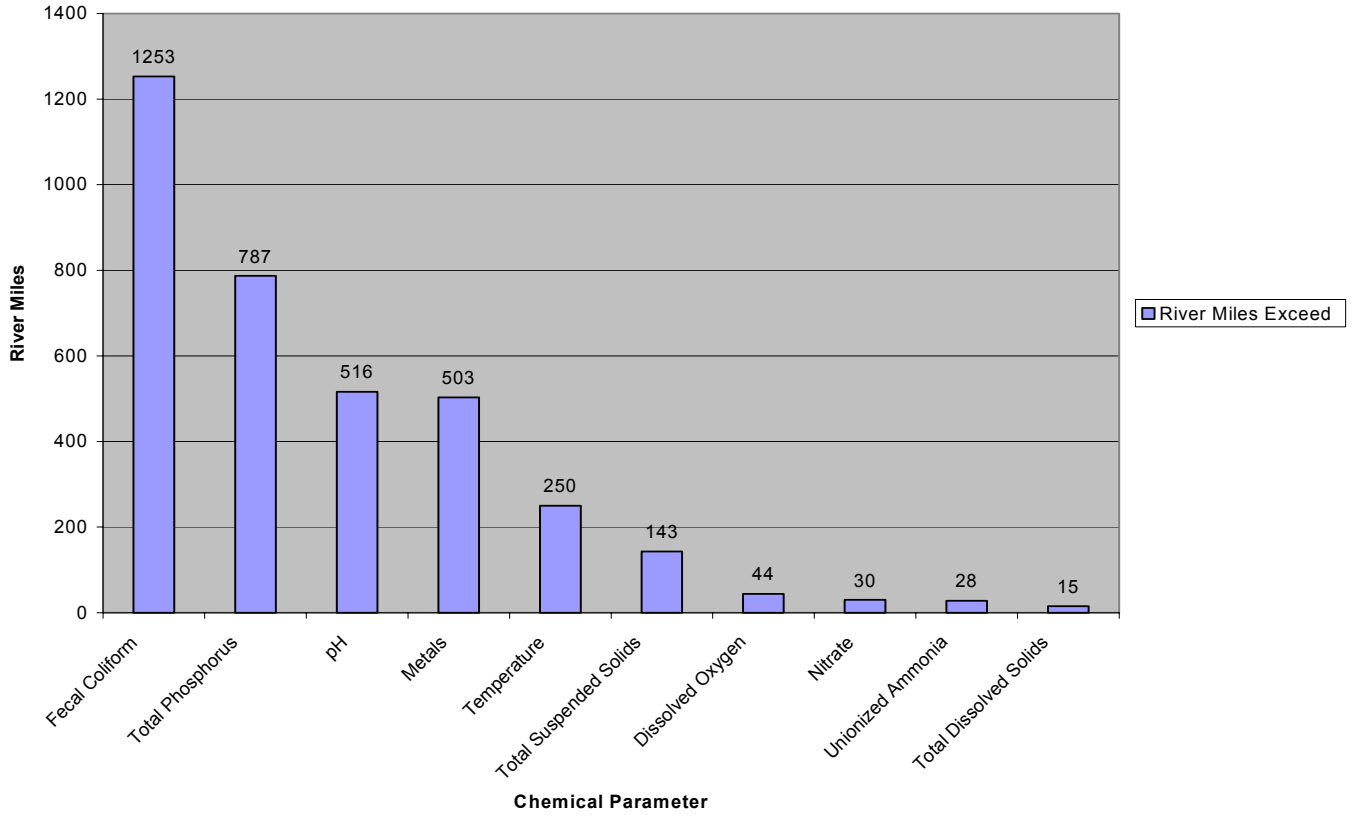


FIGURE 2.1-1. River Miles with Chemical Exceedances. Graph based on 10 chemical parameters evaluated in non-tidal rivers

FIGURE 2.1-2. Chemical Monitoring Stations.

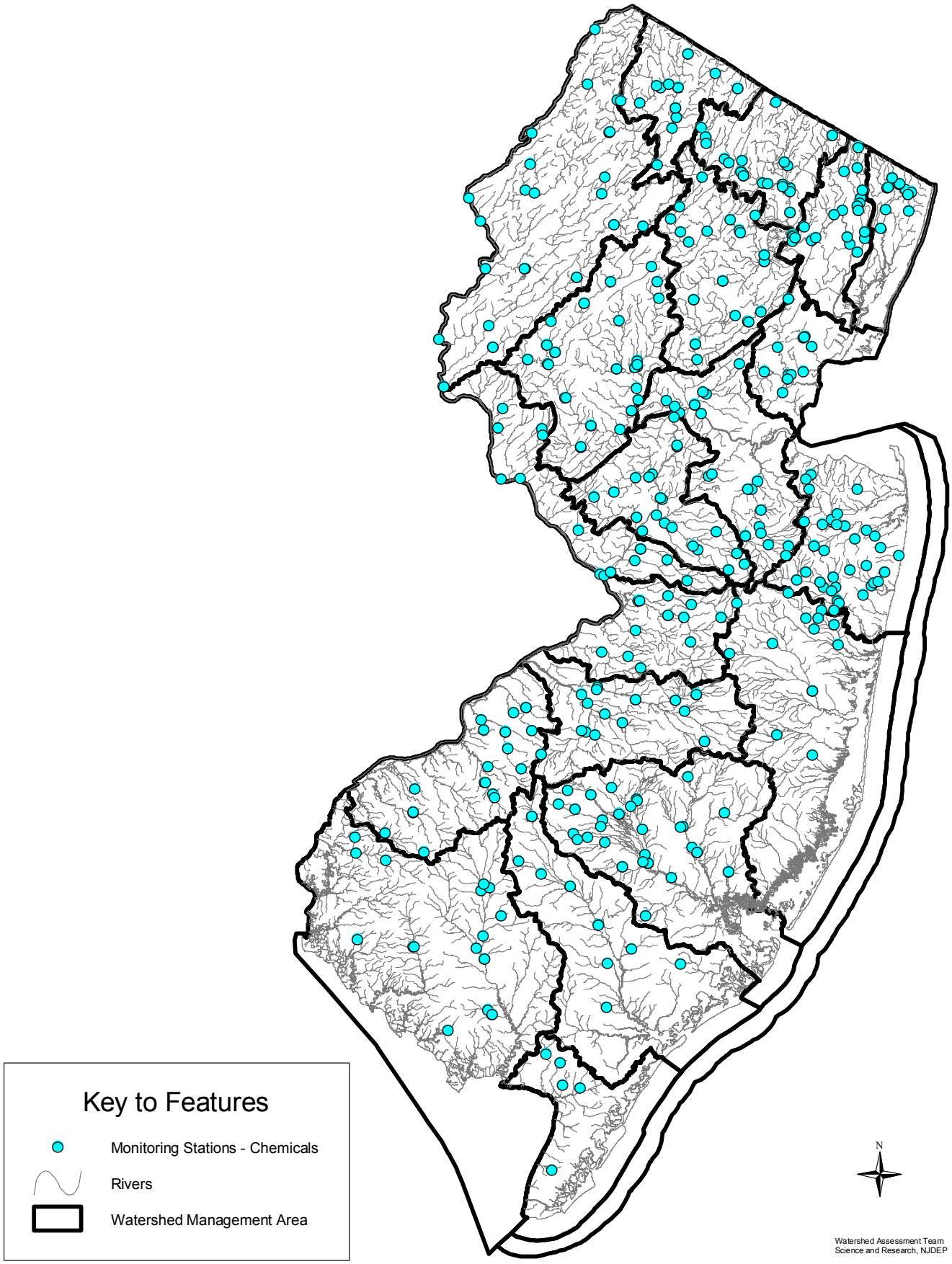
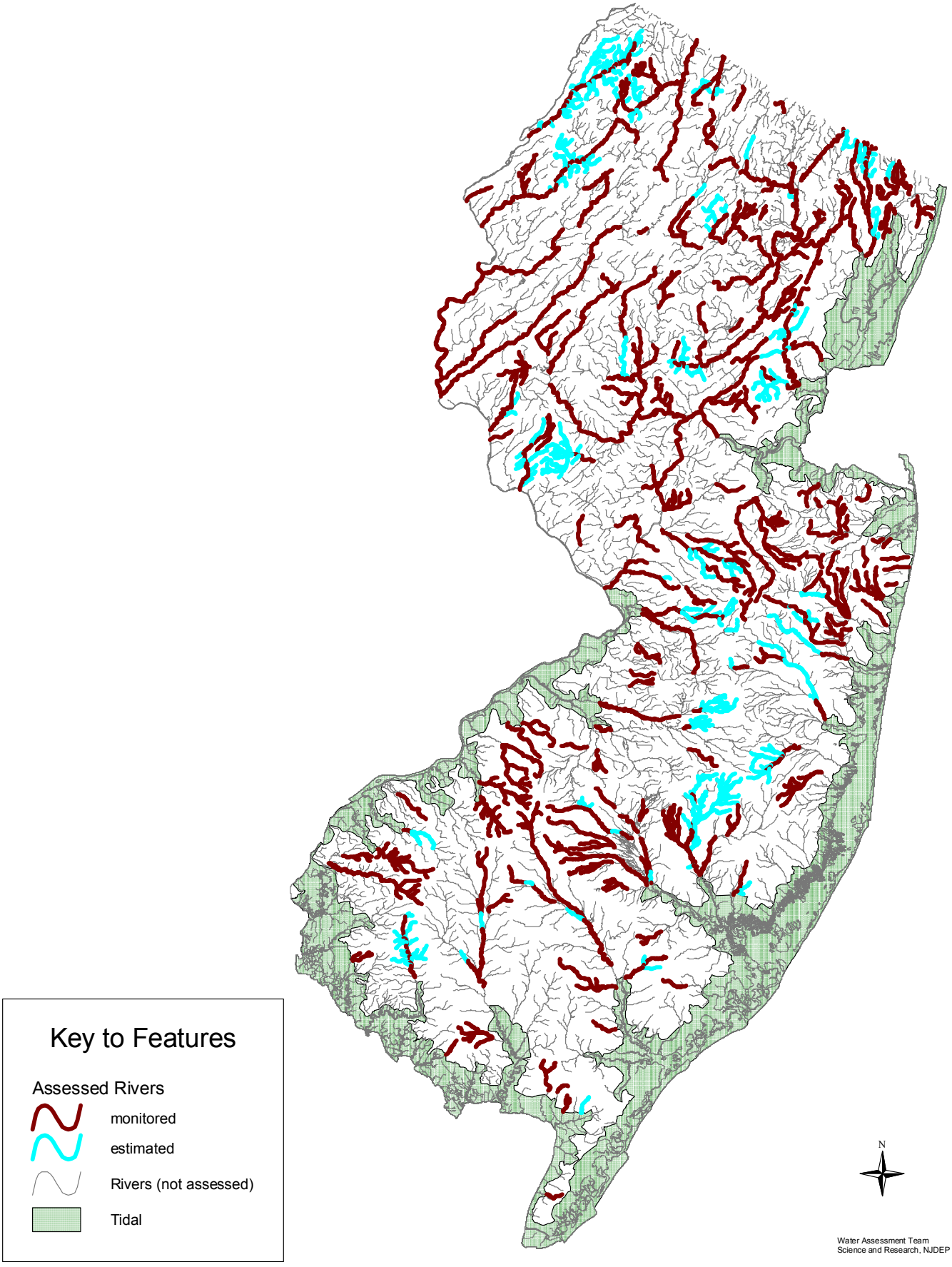


FIGURE 2.1-2b. Types of Assessed Non-Tidal Rivers. Monitored and estimated river reaches.



Section 2.1a. Conventional Assessments

Convenional water quality parameters include: total phosphorus, pH, dissolved oxygen, temperature, fecal coliform, nitrate, total suspended solids, total dissolved solids, and unionized ammonia. Prior exceedances of the SWQS for conventional water quality parameters in non-tidal rivers have been documented at 103 sites in the 1998 303(d) List with many of the sites having multiple conventionals exceeding the standards. Since the 1998 303(d) List was published, extensive data sampling has been completed (see Data Sources below). A total of 85 individual conventional listing (28% of the conventional listings on the 1998 303(d) List) from the 103 sampling sites were delisted after new data confirmed that conditions met the SWQS. 149 listing were re-assessed and found to continue to have exceedances of the standards, and 63 listing were carried over from the 1998 303(d) List due to no new data available or insufficient data to make a new assessment.

Note: Two historical stations on the 1998 303(d) List are located in tidal rivers but their assessments were included in this section (Section 2.1a). The reason these sites were accidently included in the non-tidal river section was that these sites were part of the NJDEP/USGS Ambient Stream Monitoring Network (ASMN), which monitors only in non-tidal water, so they were originally though to be in non-tidal river sections. However, after updating the head of tide delineations, it was discovered these sites were tidal, but the assessments were already completed. These sites will be corrected in the 2004 Integrated Report.

Data Sources

Sites represented on the 1998 303(d) list are primarily based upon data from the ASMN. The collection of new data has expanded the number of sites significantly. See Appendix II, Data Sources for the 2002 NJ Integrated Report for details of the monitoring networks. Below are the data network sources for conventional water quality parameters on the 2002 Integrated List:

- NJDEP/USGS Ambient Stream Monitoring Network (ASMN) (76 sites)– Data collected prior to October 1997. 42 stations were discontinued in October 1997. These sites are based on the latest assessment results from the 2000 305(b) report which used data from 1995 to 1997. The current protocol described in the Methods Document was followed for the final assessment results.

- NJDEP/USGS Redesigned Ambient Stream Monitoring Network (Redesigned ASMN) (179 sites) – Data collected from October 1997 to Present.

- Monmouth County Health Department (39 sites) - Data collected from 1996-2000.

- USGS/Pinelands Commission Network (15 sites) – Data collected from 1996 – 1998.

- Pequannock River Coalition (13 sites) – Data collected from 1998 – 2000. 1 site also part of the ASMN.

- National Water Quality Assessment Network (NAWQA) (6 sites) – Data collected from 1996-1998. 5 sites also part of the ASMN.

Total Phosphorus Water Quality Assessment

Total phosphorus (TP) is a nutrient that has been found to be limiting in many freshwater systems. "Limiting nutrients" are present in pristine systems in very low concentrations and tend to limit the growth of aquatic algae and vegetation. Elevated nutrients can contribute to excessive primary production (i.e., growth of aquatic algae and vegetation). Waterbodies affected by excessive primary productivity are characterized by significant algae and weed growth and episodes of low dissolved oxygen. To protect surface waters from excessive primary productivity, NJ SWQS include nutrient policies and criteria for total phosphorus. (See N.J.A.C. 7:9B-1.5(g) and 1.14(c)). For this report, the total phosphorus criteria of 0.1 mg/l was used to determine if water quality was fully attaining or non attaining. In the case of rivers at the point where it enters lakes, the criteria is 0.05 mg/l. However, no stations are located at the point of entering lakes, therefore, the criteria of 0.05 mg/l was not applied to any assessment of water quality.

A total of 257 stations representing 2,179 river miles were assessed for total phosphorus. The average TP for all sites was 0.1 mg/l. Excluding sites with insufficient data, the assessment results show that almost half of the stations do not meet TP standards (45% non attaining, 55% attaining). The Pinelands, southeast, and northwest portions of the state had a majority of their stations fully meeting TP criteria, while the remaining sections of the state had a substantial number of sites not meeting standards.

Thirteen sites, mostly in the Pinelands, had extremely low TP concentrations with TP averages less than 0.011 mg/l. On the other hand, 19 stations exceeded the criteria in at least 80% of samples collected. Two stations, Whippany River at Morristown and Whippany River at Pine Brook, were placed on Sublist 4 since TMDLs were completed by the Department, but TP levels continue to exceed the standards. Review of the data also shows that TP levels in the Passaic River Basin are elevated, including six sites of the top ten highest median total phosphorus concentrations statewide (see Table 2.1a-3), and 8 of 19 sites that exceeded the criteria at least 80% of the samples collected.

As seen in the 2000 New Jersey Water Quality Inventory Report 305(b), of 79 stations assessed for TP trends, statistically significant decreasing trends in concentration were found at 40 stations (50%) between 1985 and 1995. (USGS, 1999). Statistically significant trends were not found at 35 locations (44%) and a statistically significant increasing trend in concentration was found at only 1 station between 1986 and 1995. The trends assessment indicated that waters currently fully meeting TP criteria would continue to meet applicable criteria.

Results of the TP assessment are summarized below in Table 2.1a-1. Results for individual stations are depicted in Figure 2.1a-1 and in Table II-1 and Table II-10 in the Appendix.

Table 2.1a-1: Total Phosphorus Status

TP Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	137	46%	837	332	49%	69%
Sublist 3	41	14%	198	13	12%	3%
Sublist 4	2	1%	12	0	1%	0%
Sublist 5	113	39%	649	138	38%	28%
Totals	293	100%	1696	483	100%	100%

Table 2.1a-2: Stations Exceeding SWQS for TP

WMA	Station Number	Station Name		WMA	Station Number	Station Name
02	01367625	Wallkill River at Sparta		14	01409416	Hammonton Creek at Westcoatville
02	01367700	Wallkill River at Franklin		01	01445500	Pequest River at Pequest
02	01367910	Papakating Creek at Sussex		01	01446400	Pequest River at Belvidere
05	01377499	Musquapsink Brook at River Vale		01	01455200	Pohatcong Creek at New Village
05	01377500	Pascack Brook at Westwood		01	01455801	Musconetcog River at Lockwood
05	01378500	Hackensack River at New Milford		01	01457400	Musconetcong River at Riegelsville
05	01378560	Coles Brook at Hackensack		11	01461300	Wickecheoke Creek at Stockton
06	01378855	Black Brook at Madison		20	01464000	Assunpink Creek at Trenton
06	01379000	Passaic River near Millington		20	01464020	Assunpink Creek at Peace Street At Trenton
06	01379200	Dead River near Millington		20	01464420	Crosswicks Creek near New Egypt
06	01379500	Passaic River near Chatham		20	01464500	Crosswicks Creek at Extonville
06	01381200	Rockaway River at Pine Brook		20	01464504	Crosswicks Creek at Groveville Rd. at Groveville
06	01382000	Passaic River near Two Bridges		20	01464515	Doctors Creek at Allentown
03	01387000	Wanaque River at Wanaque		20	01464578	Annaricken Brook near Jobstown
03	01387500	Ramapo River near Mahwah		20	01464583	NB Barkers Brook near Jobstown
04	01389005	Passaic River below Pompton River at Two Bridges		19	01465850	SB Rancocas Creek at Vincentown
04	01389130	Passaic River at Sigac		19	01465884	Sharps Run at Rt. 541 at Medford
04	01389500	Passaic River at Little Falls		19	01465970	NB Rancocas Creek at Browns Mills
04	01389880	Passaic River at Elmwook Park		19	01467005	NB Rancocas Creek at Iron Works Park at Mt Holly
04	01391200	Saddle River at Fairlawn		19	01467006	NB Rancocas Creek at Pine St. at Mt. Holly
04	01391490	Saddle River at Rochelle Park		18	01467069	NB Pennsauken Creek near Moorestown
04	01391500	Saddle River at Lodi		18	01467081	SB Pennsauken Creek at Cherry Hill
07	01393350	WB Elizabeth River near Union		18	01467120	Cooper River at Lindenwold
07	01393450	Elizabeth River at Ursino Lake at Elizabeth		8	01467140	Cooper River at Lawnside
07	01393960	WB Rahway River at Northfield Ave. at West Orange		18	01467150	Cooper River at Haddonfield
07	01395000	Rahway River at Rahway		18	01467329	SB Big Timber Creek at Blackwood Terrace
07	01395200	Robinson Branch at Scotch Plains		18	01467359	NB Big Timber Creek at Glendora
07	01396003	Robinson Br at St Georges Ave. at Rahway		18	01477120	Raccoon Creek near Swedesboro
08	01396280	SB Raritan River at Middle Valley		18	01477510	Oldsmans Creek at Porches Mill
08	01396800	Spruce Run at Clinton		17	01482500	Salem River at Woodstown
08	01397400	SB Raritan River at Three Bridges		17	01482560	Two Penny Run near Danceys Corner
08	01398000	Neshanic River at Reaville		20	2	Crosswicks Creek at Walnford Rd in Upper Freehold
08	01398102	SB Raritan River at South Branch		12	20	Gravelly Brook at Lloyd Rd. in Marlboro
08	01399200	Lamington River near Ironia		12	21	Big Brook at Maywood Drive in Marlboro
08	01399500	Lamington River near Pottersville		09	22	McGolliard Brook at Main St in Englishtown
08	01399700	Rockaway Creek at Whitehouse		12	25	Long Brook at Howell Rd. in Howell
08	01399780	Lamington River at Burnt Mills		20	3	Doctors Creek at Route 539 in Upper Freehold
08	01400000	NB Raritan River near Raritan		12	30	Shark River Brook at Shark River Station Rd
09	01400500	Raritan River at Manville		12	31	Whale Pond Brook at Route 35 in Eatontown
10	01400540	Millstone River near Manalapan		12	32	Lafetra's Brook at Hope Rd in Tinton Falls
10	01400640	Millstone River near Grovers Mill		11	4	Assunpink Creek at Route 539 in Upper Freehold
10	01400650	Millstone River at Grovers Mill		10	5	Millstone River at Route 33 in Millstone
10	01401000	Stony Brook at Princeton		12	52	Willow Brook at Willow Brook Rd in Holmdel
10	01401440	Millstone River at Kingston		12	53	Ramanessin Brook at Willow Rd in Holmdel
10	01401600	Bedens Brook near Rocky Hill		12	54	Bordons Brook at Route 520 in Holmdel
10	01401700	Pike Run near Rocky Hill		12	56	Barren Neck Brook at Long Bridge Rd in Colts Neck
10	01402000	Millstone River at Blackwell Mills		12	57	Big Brook at Laurelwood Dr in Colts Neck
10	01402540	Millstone River at Weston		13	6	NB Metedeconk at Jackson Mills Rd in Freehold
09	01403300	Raritan River at Queens Bridge		09	61	Lake Topanemus at Pond Rd in Freehold
09	01403385	Bound Brook at Route 28 At Middlesex		09	68	Wemrock Brook at Rt 9 (Before Pipes) in Freehold
09	01403900	Bound Brook at Middlesex		09	69	Wemrock Brook at Rt 9 (After 1st Pipe) in Freehold
09	01405340	Manalapan Brook at Federal Rd Near Manalapan		13	7	Toms River at Route 537 in Millstone
09	01405400	Manalapan Brook near Spotswood		09	9	Weemaconk Creek at Main St in Manalapan
12	01407630	Poplar Brook at Deal		14		Mullica River at Green Bank
12	01407750	Shark River near Neptune City		19		SB Rancocas Creek at Hainesport
12	01407997	Marsh Bog Brook at Squankum		17		Salem River at Courses Landing
12	01408000	Manasquan River at Squankum				

Table 2.1a-3: Top 10 sites for Median Total Phosphorus Concentrations

WMA	Station Number	Station Name	Number of Samples	Percent Exceed	Median TP
06	01379200	Dead River near Millington	16	93.8%	1.12
06	01382000	Passaic River near Two Bridges	61	96.7%	0.45
06	01389005	Passaic River below Pompton River at Two Bridges	14	100.0%	0.35
06	01389500	Passaic River at Little Falls	26	100.0%	0.38
04	01391490	Saddle River at Rochelle Park	4	100.0%	0.64
04	01391500	Saddle River at Lodi	23	100.0%	0.72
10	01402000	Millstone River at Blackwells Mills	21	100.0%	0.30
11	01464020	Assunpink Creek at Peace Street at Trenton	12	100.0%	0.66
20	01464420	Crosswicks Creek near New Egypt	4	75.0%	0.28
20	01464578	Annaricken Brook near Jobstown	4	100.0%	0.45

Of the 94 stations on the 1998 Impaired Waterbodies List; 25 sites were delisted based on more recent data (Table 2.1a-5), 19 sites had no new data and were carried over to Sublist 5 on the 2002 Integrated List (Table 2.1a-4), and 50 sites were re-assessed with more recent data and evaluated as "Non Attainment" for total phosphorus.

Table 2.1a-4: TP Sites Carried Over from 1998 303(d) List

WMA	Station Number	Station Name
02	01367700	Wallkill River at Franklin
05	01378500	Hackensack River at New Milford
03	01387000	Wanaque River at Wanaque
04	01389130	Passaic River at Sigac
04	01391200	Saddle River at Fairlawn
08	01396800	Spruce Run at Clinton
08	01399200	Lamington River Near Ironia
10	01401440	Millstone River at Kingston
10	01402540	Millstone River at Weston
09	01405400	Manalapan Brook near Spotswood
12	01407750	Shark River near Neptune City
01	01455801	Musconetcong River at Lockwood
11	01461300	Wickecheoke Creek at Stockton
19	01465970	NB Rancocas Creek at Browns Mills
18	01467120	Cooper River at Lindenwold
18	01467140	Cooper River at Lawnside
17		Mullica River at Green Bank
19		SB Rancocas Creek at Hainesport
17		Salem River at Courses Landing

Table 2.1a-5: Delisted TP Sites From 1998 303(d) List

WMA	Station Number	Station Name
02	01367770	Wallkill River near Sussex
02	01368000	Wallkill Run near Unionville
02	01368950	Black Creek near Vernon
05	01377000	Hackensack River at Rivervale
06	01380500	Rockaway River at Boonton
03	01382500	Pequannock River at Macopin Intake Dam
04	01388500	Pompton River at Pompton Plains
07	01394500	Rahway River near Springfield
08	01396535	SB Raritan River at Arch St at High Bridge
08	01396588	Spruce Run near Glen Gardner
08	01396660	Mulhockaway Creek at Van Syckel
08	01398260	NB Raritan River near Chester
08	01399120	NB Raritan River at Burnt Mills
08	01397000	SB Raritan River at Stanton Station
10	01405302	Matchaponix Brook at Spotswood
14	01409500	Batsto River at Batsto
15	01410784	Great Egg Harbor River near Sicklerville
15	01411000	Great Egg Harbor River at Folsom
15	01411110	Great Egg Harbor River at Weymouth
17	01411800	Maurice River near Millville
17	01412800	Cohansey River at Seeley
01	01443440	Paulins Kill at Balesville
01	01456200	Musconetcong River at Beattystown
01	01457000	Musconetcong River near Bloomsbury
20	01463620	Assunpink Creek near Clarksville

Excessive primary productivity may impair aquatic life and recreational designated uses. Additional assessments are needed to identify designated use impairments due to excessive primary productivity and to evaluate the relative contributions of phosphorus, nitrate and other nutrients. Therefore, it was not possible to link elevated concentrations of TP to use impairment. Some major considerations include:

- Attached periphyton is often the major location of primary productivity in streams- not free floating algae
- Nutrient cycling between water--sediments--aquatic periphyton community may result in water column nutrient measurements that are very low concentrations even though the waterbody is eutrophic (nutrients are fixed in aquatic plants and algae)
- Watershed Location is Critical: Depositional areas, wetlands, lakes, reservoirs are most prone to eutrophication, not fast flowing streams. Existing monitoring sites are not targeted to these areas.
- Season, stream flow, storm events have significant effects on primary production and nutrient limitation

FIGURE 2.1a-1. **Total Phosphorus Station Status**. Includes delisted sites and sites carried over from the 1998 303(d) List.

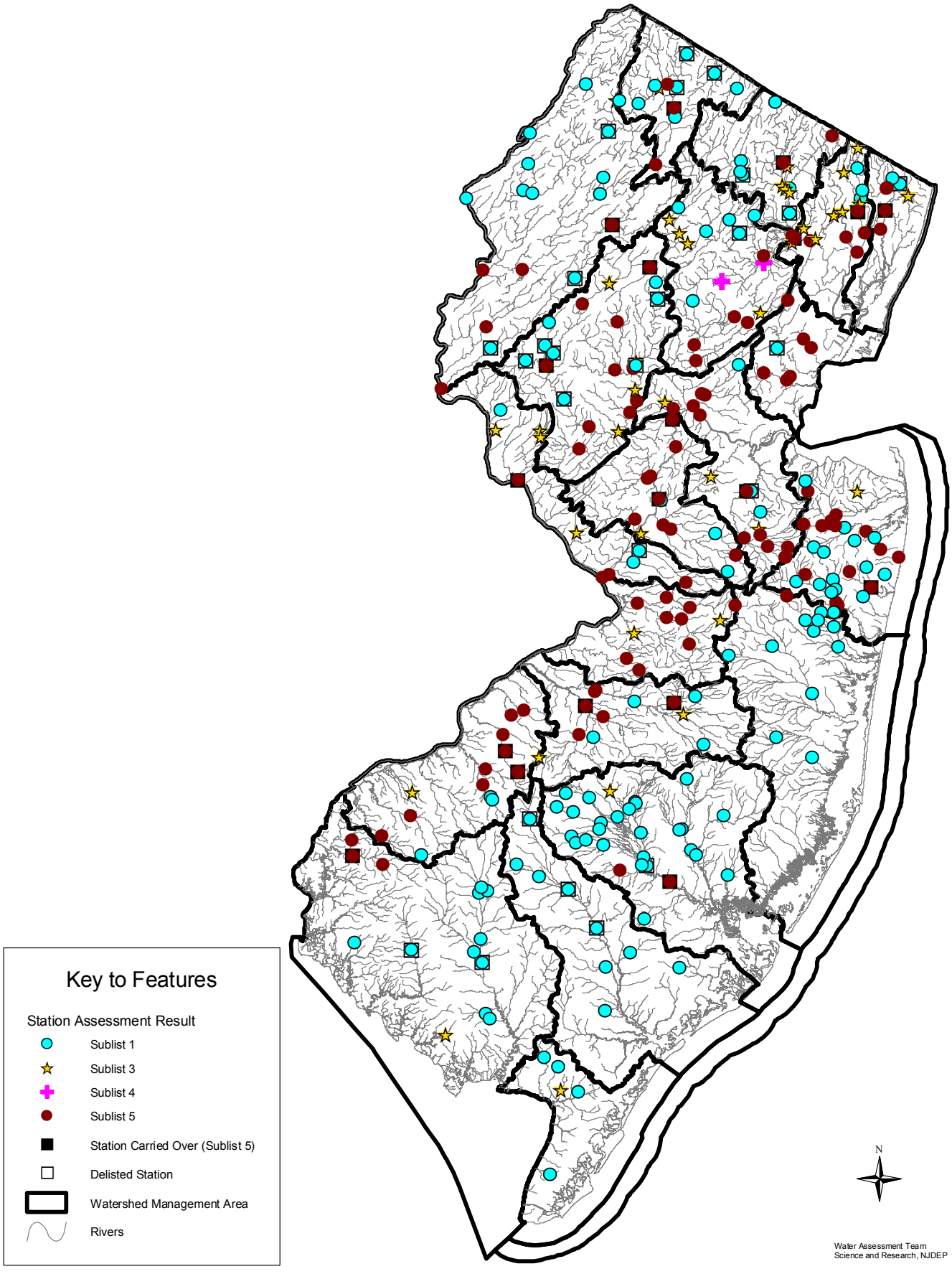
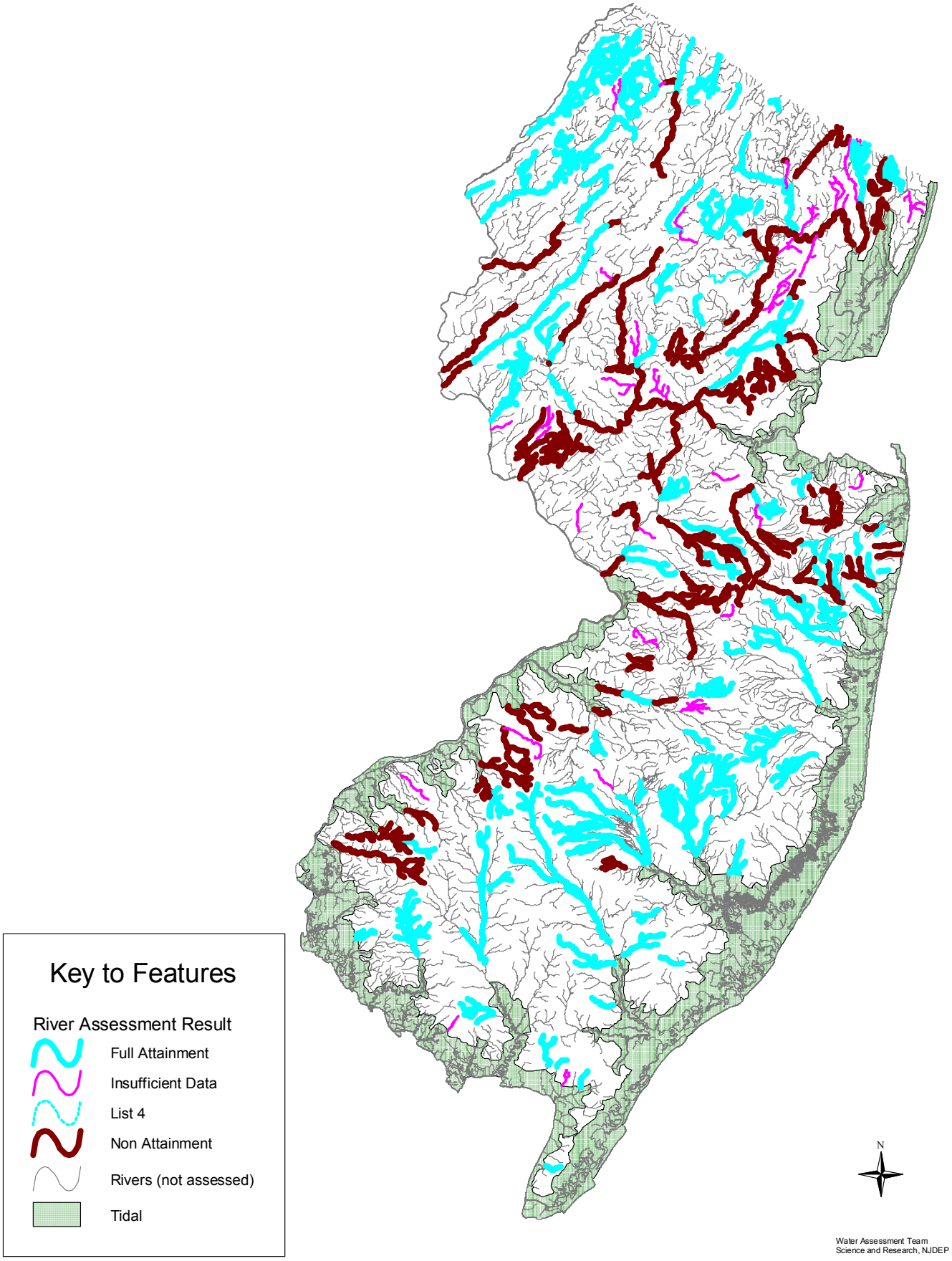


FIGURE 2.1a-2. Total Phosphorus Assessed River Segments. Includes monitored and estimated river assessments.



pH Water Quality Assessment

pH is a measure of the acidity of water. NJ SWQS include criteria for pH due to effects on aquatic life at pH measurements that are too basic or too acidic. Criteria for the naturally acidic Pinelands waters require pH between 3.5 and 5.5 pH units. Criteria for all other nontidal streams in the state (FW2 waters) require pH between 6.5 and 8.5 pH units. Thus, criteria for pH require levels between a specified range, and exceedances of the criteria can occur if pH is either too low or too high.

238 stations representing 2,152 river miles were assessed for pH. Of the 69 stations that were "Non Attaining" for pH; 36 stations were above the pH criteria, 24 stations were below the pH criteria, and 9 stations were carried over from the 1998 303(d) list. All impaired sites in the Pinelands (29 sites) had pH levels above the pH criteria. Results showed that Pineland sites with impairments were located in watersheds impacted by development, while fully attaining sites were usually in pristine or low developed watersheds.

Of the 24 stations below the pH criteria, 23 sites were located in the Coastal Plain; the only exception was Dunnfield Creek at Dunnfield in WMA 1. Further observations revealed that 20 stations with low exceedances were located in areas directly surrounding the Pinelands (see Table 2.1a-8). These areas are characterized as having environmental conditions such as soils, geology, and vegetation very similar to the Pinelands, therefore, there is speculation that the low pH at these sampling sites may be attributable to natural conditions. At all of these stations, pH levels were primarily between the SWQS for Pineland waters and FW2 waters and did not meet the criterion for pH. At four other stations in the same geographical area, pH levels met the pH criteria for Pineland waters although their stream reaches were categorized as FW2. These sites, which included a background site with no anthropogenic inputs, were assessed as "Full Attainment", and consisted of: Gibson Creek at Rt. 50 near Corbin City, Indian Branch near Malaga, Buckshutem Creek near Laurel Lake, and Gravelly Run at Laurel Lake. The SWQS include a provision to use natural water quality in place of numeric criteria for all water quality characteristics that do not meet the promulgated water quality criteria as a result of natural causes. (See N.J.A.C. 7:9B-1.5(c)1). Further technical approaches will be studied to determine if a change to the SWQS for pH to reflect natural conditions should be developed for the waterways surrounding the Pinelands.

Results for individual stations are depicted in Figure 2.1a-3 and in Table II-2 and Table II-11 in the Appendix. The overall pH results are summarized below in Table 2.1a-6.

Table 2.1a-6: pH Status

pH Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	127	45%	897	367	76%	54%
Sublist 3	89	31%	352	20	4%	32%
Sublist 4	0	0%	0	0	0%	0%
Sublist 5	69	24%	419	97	20%	14%
Totals	285	100%	1668	484	100%	100%

Table 2.1a-7: pH Stations Exceeding SWQS

WMA	Station Number	Station Name		WMA	Station Number	Station Name
04	01390500	Saddle River at Ridgewood		14	01409411	Nescochague Creek at Pleasant Mills
08	01396800	Spruce Run at Clinton		14	01409416	Hammonton Creek at Westcoatville
08	01397000	SB Raritan River at Stanton Station		14	01409432	Batsto River at Hampton Furnace
08	01398000	Neshanic River at Reaville		14	01409449	Indian Mills Brook at Indian Mills
08	01398102	SB Raritan River at South Branch		14	01409455	Springers Brook near Hampton Furnace
08	01399700	Rockaway Creek at Whitehouse		14	01409470	Batsto River at Quaker Bridge
09	01400500	Raritan River at Manville		14	01409500	Batsto River at Batsto
10	01400540	Millstone River near Manalapan		15	01410784	Great Egg Harbor River near Sicklerville
10	01400690	Cranbury Book near Prospect Plains		15	01411000	Great Egg Harbor River at Folsom
10	01401000	Stony Brook at Princeton		15	01411035	Hospitality Branch at Blue Bell Road near Cecil
10	01401440	Millstone River at Kingston		15	01411050	Hospitality Branch near Cecil
10	01402540	Millstone River at Weston		15	01411110	Great Egg Harbor River at Weymouth
10	01404470	Ireland Brook at Patricks Corners		15	01411196	Babcock Creek near Mays Landing
10	01405285	Barclay Brook near Englishtown		15	01411220	South River near Belcoville
09	01405302	Matchaponix Brook at Spotswood		16	01411428	Dennis Creek Trib 2 at Dennisville
09	01405340	Manalapan Brook at Federal Rd near Manalapan		17	01411453	Still Run near Malaga
09	01405400	Manalapan Brook near Spotswood		17	01411458	Little Ease Run at Porchtown
12	01407720	Jumping Brook at Green Grove		17	01411500	Maurice River at Norma
12	01407760	Jumping Brook near Neptune City		17	01412200	Pages Run at Newport
12	01407868	Long Brook at Wyckoff Mills		17	01413065	Canton Drain at Maskell Mill
12	01407997	Marsh Bog Brook at Squankum		17	01442760	Dunnfield Creek at Dunnfield
12	01408009	Mingamahone Brook near Earle		01	01446400	Pequest River at Belvidere
13	01408100	NB Metedeconk River at Lakewood		01	01455200	Pohatcong Creek at New Village
13	01408480	Shannoc Brook Tributary at Colliers Mills		01	01455500	Musconetcong River at Lake Hopatcong
13	01408500	Toms River near Toms River		01	01457000	Musconetcong River near Bloomsbury
14	01409375	Mullica River near Atco		11	01461300	Wickecheoke Creek at Stockton
14	0140940050	Mullica River near Batsto		11	01463850	Miry Run at Route 533 at Mercerville
14	01409401	Hays Mill Creek at Atco		20	01464529	Bacons Creek near Mansfield Square
14	01409402	Hays Mill Creek near Chesilhurst		20	01464583	NB Barkers Brook near Jobstown
14	0140940370	Sleeper Branch near Atsion		19	01465850	SB Rancocas Creek at Vincentown
14	01409408	Pump Branch near Waterford Works		19	01465893	Little Creek at Chairville
14	0140940950	Blue Anchor Brook at Elm		19	01465970	NB Rancocas Creek at Browns Mills
14	0140940970	Albertson Branch near Elm		19	01467005	NB Rancocas Creek at Iron Works Park at Mt Holly
14	0140941070	Great Swamp Branch below Rt 206 near Hammonton		19	01467006	NB Rancocas Creek at Pine St at Mt Holly
				17		Mullica River at Green Bank

Table 2.1a-8: pH Sites with Similar Conditions as Pinelands or Influenced by Pinelands

WMA	Station Number	Station Name	Max pH	Min pH	Percent Exceedance
10	01400690	Cranbury Book near Prospect Plains	6.2	5.2	100.0%
09	01405285	Barclay Brook near Englishtown	3.6	3.5	100.0%
09	01405302	Matchaponix Brook at Spotswood	7.4	5.4	42.9%
10	01400540	Millstone River near Manalapan	8.1	6.0	30.8%
09	01405340	Manalapan Brook at Federal Road near Manalapan	7.3	5.2	38.1%
12	01407720	Jumping Brook at Green Grove	6.5	5.9	75.0%
12	01407868	Long Brook at Wyckoff Mills	7.1	6.4	18.2%
12	01407997	Marsh Bog Brook at Squankum	6.5	4.7	75.0%
12	01408009	Mingamahone Brook near Earle	7.1	5.7	41.7%
13	01408100	NB Metedeconk River at Lakewood	7.1	5.9	50.0%
13	01408500	Toms River near Toms River	6.4	4.4	100.0%
15	01411241	Gibson Creek at Rt 50 near Corbin City	5.4	4.8	100.0%
17	01411453	Still Run near Malaga	6.6	5.6	50.0%
17	01411466	Indian Branch near Malaga	5.6	4.2	100.0%
17	01411458	Little Ease Run at Porchtown	6.1	5.6	100.0%
17	01411500	Maurice River at Norma	7	5.9	33.3%
17	01411950	Buckshutem Creek near Laurel Lake	4.2	4	100.0%
17	01411955	Gravelly Run at Laurel Lake	5.3	4.3	100.0%
17	01412200	Pages Run at Newport	6.5	5.9	75.0%
20	01464529	Bacons Creek near Mansfield Square	6.7	4	75.0%
20	01464583	NB Barkers Brook near Jobstown	7.3	5.8	33.3%
19	01465850	SB Rancocas Creek at Vincentown			92.9%
19	01467005	NB Rancocas Creek at Iron Works Park at Mt Holly	6.8	6.4	25.0%
19	01467006	NB Rancocas Creek at Pine St at Mt Holly	7.2	5.3	28.6%

On the 1998 303(d) list, 49 stations did not meet the criteria for pH. Many of the sites remain on Sublist 5 including 9 sites carried over to the 2002 Integrated List due to no new data (Table 2.1a-9), and 21 sites re-evaluated with recent data but still not attaining standards. A total of 19 sites were delisted from the 1998 303(d) list after assessments concluded they met pH criteria (Table 2.1a-10).

Table 2.1a-9: pH Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name
08	01396800	Spruce Run at Clinton
10	01401440	Millstone River at Kingston
10	01402540	Millstone River at Weston
09	01405400	Manalapan Brook near Spotswood
12	01407760	Jumping Brook near Neptune City
01	01455500	Musconetcong River at Lake Hopatcong
11	01461300	Wickecheoke Creek at Stockton
19	01465970	NB Rancocas Creek at Browns Mills
14		Mullica River at Green Bank

Table 2.1a-10: Delisted pH Sites From 1998 303(d) List

WMA	Station Number	Station Name
03	01381200	Rockaway River at Pine Brook
03	01382500	Pequannock River at Macopin Intake Dam
08	01396280	SB Raritan River at Middle Valley
08	01396535	SB Raritan River at Arch St at High Bridge
08	01396588	Spruce Run near Glen Gardner
08	01396660	Mulhockaway Creek at Van Syckel
08	01397400	SB Raritan River at Three Bridges
08	01399120	NB Raritan River at Burnt Mills
08	01399780	Lamington River at Burnt Mills
12	01408000	Manasquan River at Squankum
14	01409387	Mullica River at Outlet of Atsion Lake at Atsion
14	01410150	EB Bass River near New Gretna
17	01412800	Cohansey River at Seeley
01	01456200	Musconetcong River at Beattystown
01	01457400	Musconetcong River at Riegelsville
20	01464515	Doctors Creek at Allentown
18	01467150	Cooper River at Haddonfield
18	01477510	Oldsmans Creek at Porches Mill
17	01482500	Salem River at Woodstown

FIGURE 2.1a-3. pH Station Status. Includes delisted sites and sites carried over from the 1998 303(d) List, as well as, sites on sublist 5 that are influenced by Pineland conditions.

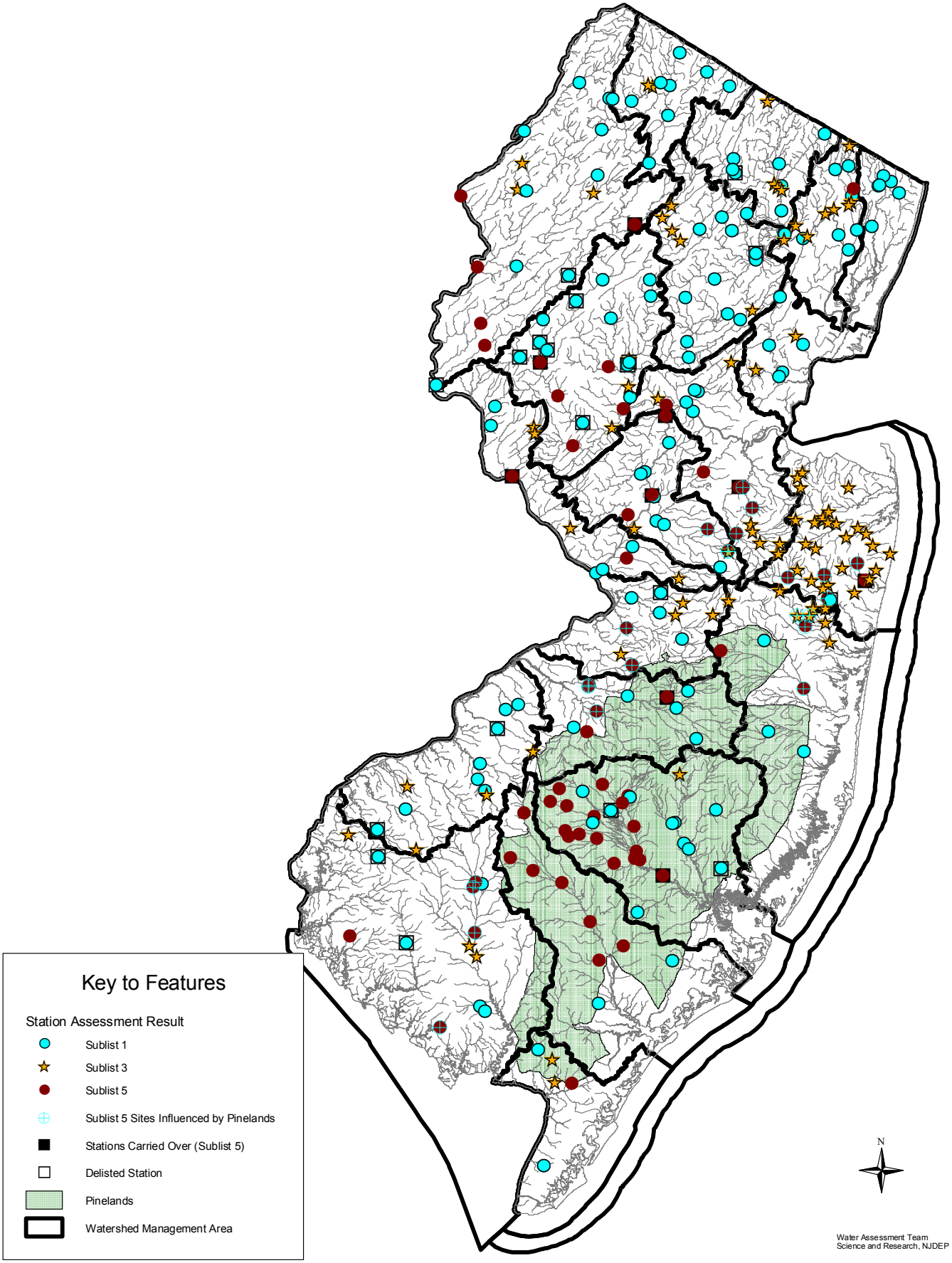
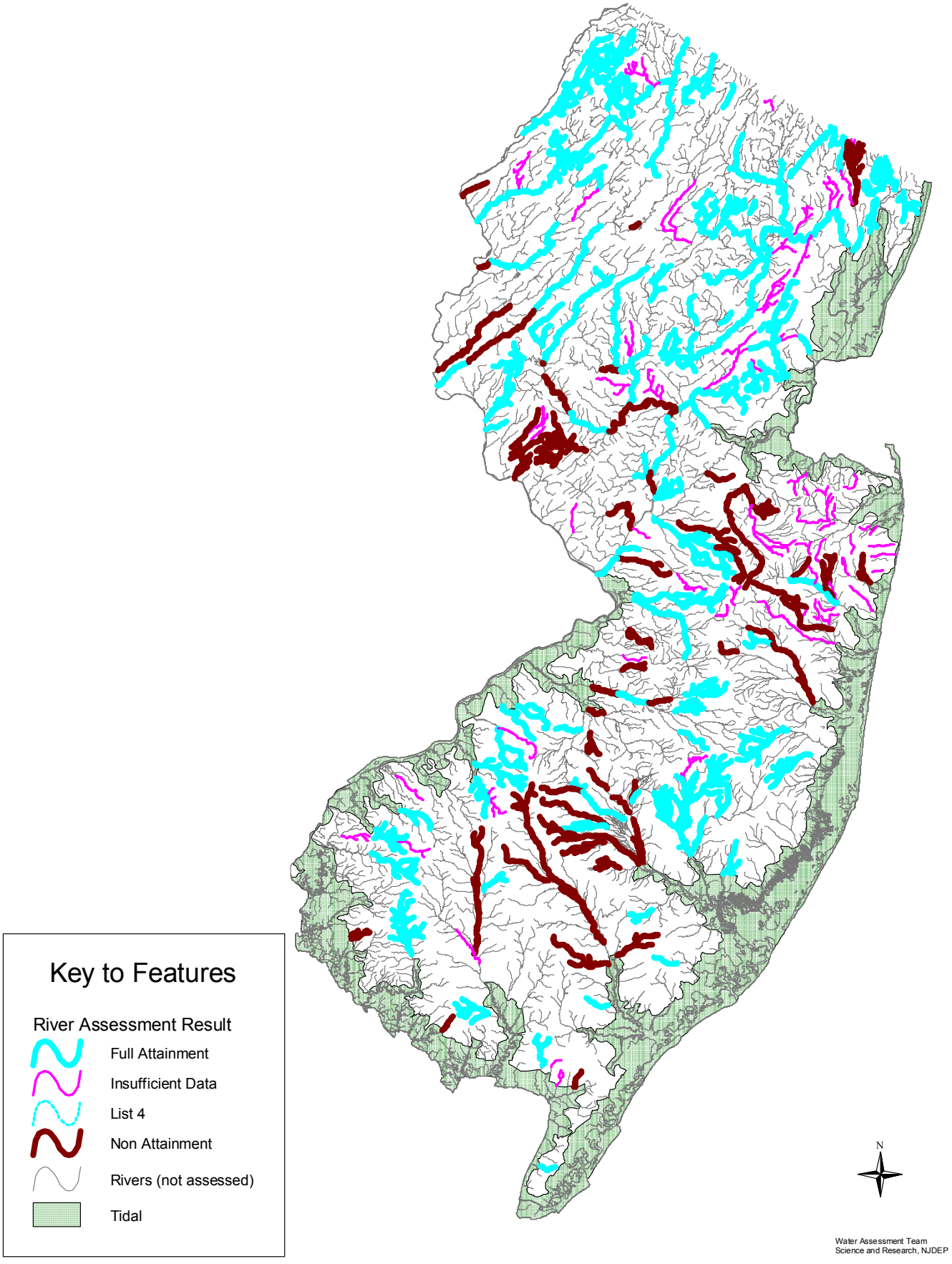


FIGURE 2.1a-4. pH Assessed River Segments. Includes monitored and estimated river assessments.



Dissolved Oxygen Water Quality Assessment

Dissolved oxygen (DO) is necessary for almost all aquatic life, consequently concentrations of dissolved oxygen in water also provide an indicator of the health of aquatic ecosystems. When in equilibrium with air, the ability of water to maintain dissolved oxygen is dependant on temperature, atmospheric pressure, and to a lesser extent dissolved solids (USGS 2000). Temperature is the major factor in determining DO levels under ambient conditions with increasing temperatures causing decreasing DO. Because of this direct correlation, temperature data should be closely monitored when DO levels exceed Surface Water Quality Standards. Dissolved oxygen criteria are based on the following stream classifications:

- FW2-Trout Production: Not less than 7.0 mg/l DO
- FW2-Trout Maintenance: Not less than 5.0 mg/l DO, 24 hr. average not less than 5.0 mg/l DO
- FW2-Non Trout/Pinelands: Not less than 4.0 mg/l DO, 24 hr. average not less than 5.0 mg/l DO

Overall results indicate that dissolved oxygen levels in the state are relatively healthy. The assessment of data collected between 1996-2000 show that only 3 of 238 sites are not attaining dissolved oxygen standards and the overall average of all sites is 9.6 mg/l DO. When excluding sublist 3 sites with insufficient data, 96% of the stations are fully attaining, while only 4% are non attaining the standards for DO. This represents only 44 river miles not attaining standards for dissolved oxygen in the state.

It should be noted that the collection of DO data was taken during the day and consequently does not characterize the natural diurnal DO cycle. The diurnal cycle may show significant variations in DO levels during a 24 hour period caused by temperature changes, photosynthesis, and respiration variations in the streams. In order to help understand this process, NJDEP and USGS are collecting diurnal DO data at about 30 locations each summer starting in 2001. Selected locations included background stations in the redesigned Ambient Surface Water Monitoring Network (ASMN), locations with exceedances of DO criteria, and locations with high DO saturation values which may indicate DO impairments.

The overall status of DO is shown in Table 2.1a-11 and results for stations that exceeded criteria and their use support status are provided on Table 2.1a-12 below. Results for individual stations are depicted on Figure2.1a-5 and shown in Table II-4 in the Appendix.

Table 2.1a-11: DissolvedOxygen Status

DO Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	196	81%	1309	428	84%	92%
Sublist 3	38	16%	208	33	13%	7%
Sublist 4	0	0%	0	0	0%	0%
Sublist 5	7	3%	39	5	3%	1%
Totals	241	100%	1556	466	100%	100%

Table 2.1a-12: Stations with Exceedances of DO

WMA	Station Number	Station Name	Number of Samples	Percent Exceedance	SWQS Attainment
06	01379000	Passaic River near Millington	16	25%	Non Attainment
06	01381800	Whippany River near Pine Brook	23	13%	Non Attainment
03	01387000	Wanaque River at Wanaque	1998 303(d) List		Non Attainment
08	01399200	Lamington River near Ironia	1998 303(d) List		Non Attainment
15	01409383	Mullica River at Indian Mills	18	17%	Non Attainment
19	01466500	McDonalds Branch in Lebanon State Forest	14	57%	Full Attainment
18	01467140	Cooper River at Lawnside	1998 303(d) List		Non Attainment
17		Salem River at Courses Landing	1998 303(d) List		Non Attainment

The McDonalds Branch impairment in Lebanon State Forest is due to natural conditions with a location in an area dominated by ground water and low DO; it is not due to pollution sources. Several sites have been carried over from the 1998 303(d) List because more recent data had not been collected. These sites include: Wanaque River at Wanaque, Lamington River near Ironia, Cooper River at Lawnside, and Salem River at Courses Landing. There are 6 sites on the 1998 303(d) List for exceedances of DO where criteria are now met (see Table 2.1a-13). These findings are consistent with historical improvements in water quality as wastewater treatment plants were upgraded and regionalized in the 1980's and early 1990's.

Table 2.1a-13: Delisted DO Sites From 1998 303(d) List

WMA	Station Number	Station Name
15	01410784	Great Egg Harbor River near Sicklerville
14	01409416	Hammonton Creek at Westcoatville
10	01400650	Millstone River at Grovers Mill
06	01382000	Passaic River at Two Bridges
04	01391500	Saddle River at Lodi
07	01394500	Rahway River near Springfield

FIGURE 2.1a-5. **Dissolved Oxygen Station Status**. Includes delisted stations and sites carried over from the 1998 303(d) List.

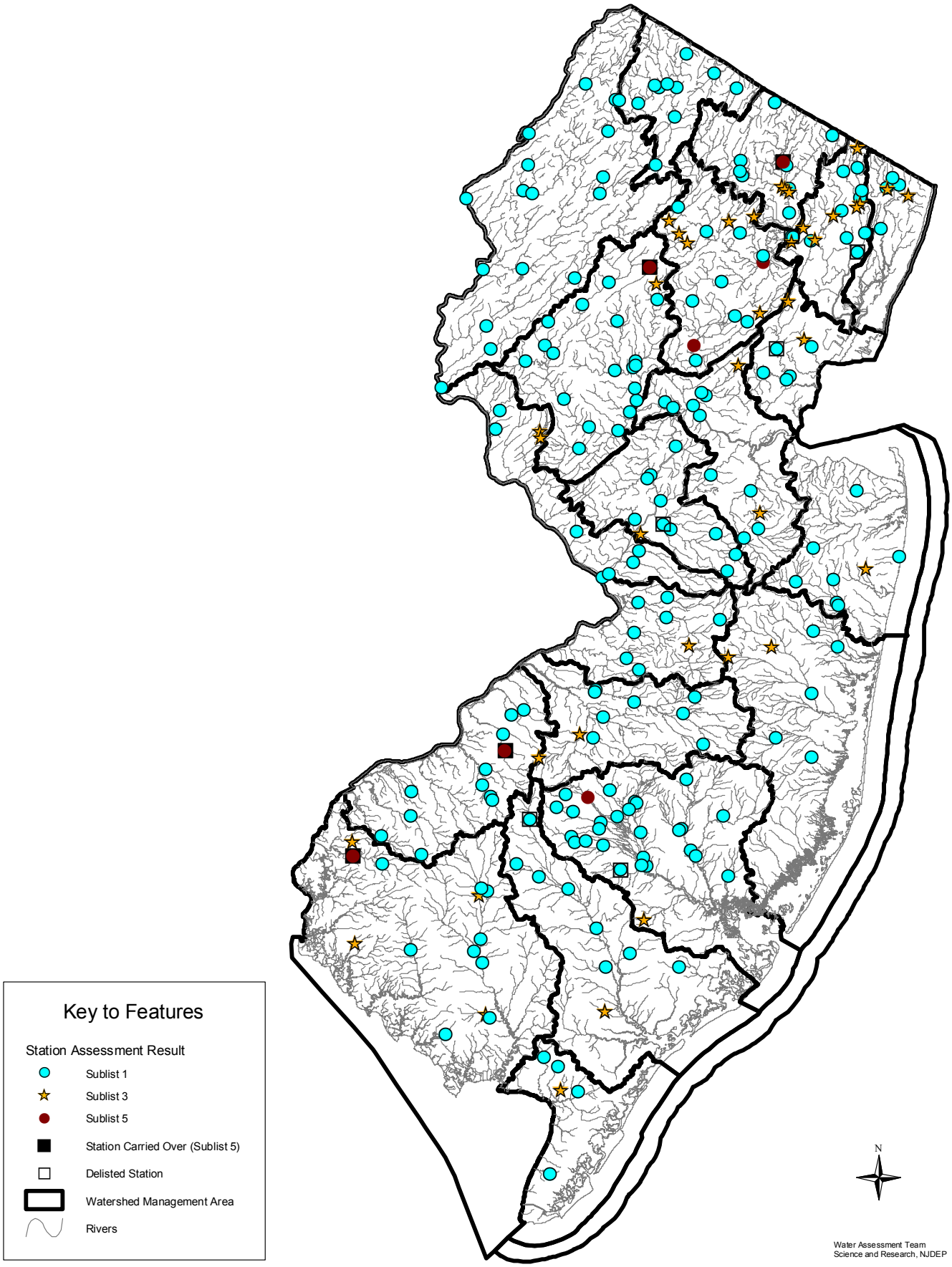
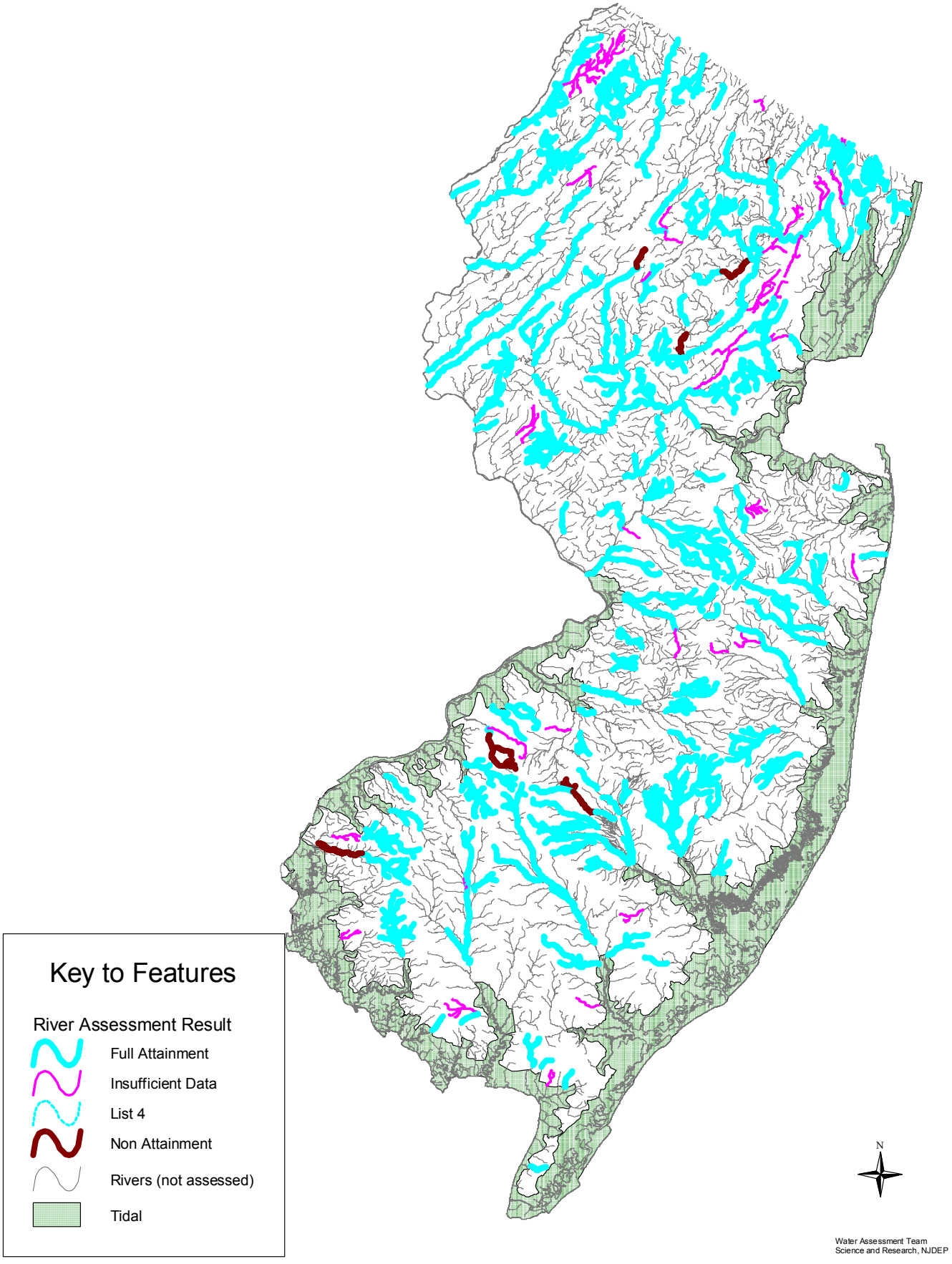


FIGURE 2.1a-6. Dissolved Oxygen Assessed River Segments. Includes monitored and estimated river assessments.



Temperature Water Quality Assessment

Temperature criteria were established to protect aquatic life designated uses, and are based upon stream classifications. The criteria for stream classifications do not allow thermal alterations that would cause temperatures to exceed ambient temperatures by an established limit, in addition, enforce a maximum temperature limit. The stream classification criteria include:

- Trout Production waters – No temperature deviations of 0.6EC above ambient temperatures or (20EC used as a maximum temperature);
- Trout Maintenance waters – No temperature deviations of 1.1EC above ambient temperatures or a maximum temperature no greater than 20EC;
- Non trout waters – No temperature deviations greater than 2.8EC above ambient temperatures or maximum temperatures no greater than 27.8EC for small mouth bass or yellow perch waters or 30EC for other nontrout waters,
- Pineland waters – No temperature deviations greater than 2.8EC above ambient temperatures or maximum temperatures no greater than 30EC.

The assessments in this report used the maximum temperature as the criteria since ambient water temperatures for streams have not been calculated.

Approximately 2,070 river miles representing 257 sites were assessed for temperature. Excluding sites having insufficient data, results indicate 87% of the sites fully attain standards for temperature and 13% of the sites exceed the standards. All sites with exceedances for temperature were either trout production or trout maintenance waters, whereas streams classified as non trout or Pineland waters fully attained standards for temperature throughout the state. The only exceptions were 3 sites carried over from the 1998 303(d) List that have no updated data (see Table 2.1a-16). One site, Pequannock River above Pacock, was placed on List 4 due to the building of a beaver dam causing the temperature exceedances. Most of the sites not attaining temperature standards are located in northwest New Jersey and the upper portion of South Branch Raritan River.

Included in the assessment for temperature was a special study conducted by the Pequannock River Coalition during 2000 and 2001. The results of the study indicated widespread temperature violations along the Pequannock River. With the river dominated by reservoirs along its waterway, it is suspected that reservoir discharge rates may be affecting water temperature in the Pequannock River.

The overall status of temperature assessments is provided in Table 2.1a-14. Results for individual stations are depicted on Figure2.1a-7 and shown in Table II-3 in the Appendix.

Table 2.1a-14: Temperature Status

Temperature Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	195	76%	1239	374	78%	77%
Sublist 3	32	12%	167	35	11%	7%
Sublist 4	1	1%	5	0	>1%	0%
Sublist 5	29	11%	175	75	11%	16%
Totals	257	100%	1586	483	100%	100%

Table 2.1a-15: Temperature Stations Exceeding SWQS

WMA	Station Number	Station Name	WMA	Station Number	Station Name
02	01367625	Wallkill River at Sparta	01	01455801	Musconetcong River at Lockwood
03	01382500	Pequannock River at Macopin Intake Dam	01	01456200	Musconetcong River at Beattystown
08	01396280	SB Raritan River at Middle Valley	01	01457400	Musconetcong River at Riegelsville
08	01396535	SB Raritan River at Arch St at High Bridge	11	01461300	Wickecheoke Creek at Stockton
08	01396550	Spruce Run at Newport	03	PQ10	Pequannock River -Butler
08	01396588	Spruce Run near Glen Gardner	03	PQ11	Pequannock River at Riverdale
08	01396800	Spruce Run at Clinton	03	PQ3	Pequannock River below Pacock
08	01397000	SB Raritan River at Stanton Station	03	PQ4	Pequannock River above Clinton
10	01401440	Millstone River at Kingston	03	PQ5	Pequannock River below Clinton
13	01408100	NB Metedeconk River at Lakewood	03	PQ6	Macopin River
01	01440000	Flat Brook near Flatbrookville	03	PQ7	Pequannock River above Macopin
01	01443500	Paulins Kill at Blairstown	03	PQ8	Pequannock River below Macopin
01	01446400	Pequest River at Belvidere	17		Salem River at Courses Landing
01	01455200	Pohatcong Creek at New Village	14		Mullica River at Green Bank
01	01455500	Musconetcong River at Lake Hopatcong			

Of the 22 sites on the 1998 303(d) list, 7 were sites transferred to sublist 5 on the 2002 Integrated List (Table 2.1a-16), 9 sites were re-evaluated and remained on sublist 5, and 6 sites were delisted (Table 2.1a-17).

In a unique situation, one site, the Wallkill River at Franklin, was delisted using data from nearby sites. Data collected at Wallkill River at Scott Road at Franklin during 1999 demonstrated full compliance with the temperature criteria at the Wallkill River at Franklin site. Additional data collected in a special three day sampling effort, during the summer of 1999 called 303d Reconnaissance Monitoring, confirm temperatures consistently meet their criteria as well. Furthermore, temperature data from 1996 to 2000 at sites downstream and upstream on the Wallkill show full compliance for non trout waters.

Table 2.1a-16: Temperature Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name	Stream Classification
08	01396800	Spruce Run at Clinton	Trout Production
10	01401440	Millstone River at Kingston	Non-Trout
01	01455500	Musconetcong River at Lake Hopatcong	Trout Maintenance
01	01455801	Musconetcong River at Lockwood	Trout Maintenance
11	01461300	Wickecheoke Creek at Stockton	Trout Maintenance
17		Salem River at Courses Landing	Non-Trout
14		Mullica River at Green Bank	Non-Trout

Table 2.1a-17: Delisted Temperature Sites From 1998 303(d) List

WMA	Station Number	Station Name
02	01367700	Wallkill River at Franklin
08	01398260	NB Raritan River near Chester
08	01399500	Lamington River near Pottersville
01	01443440	Paulins Kill at Balesville
01	01457000	Musconetcong River near Bloomsbury
17	01482500	Salem River at Woodstown

FIGURE 2.1a-7. Temperature Station Status. Includes delisted stations and sites carried over from the 1998 303(d) List.

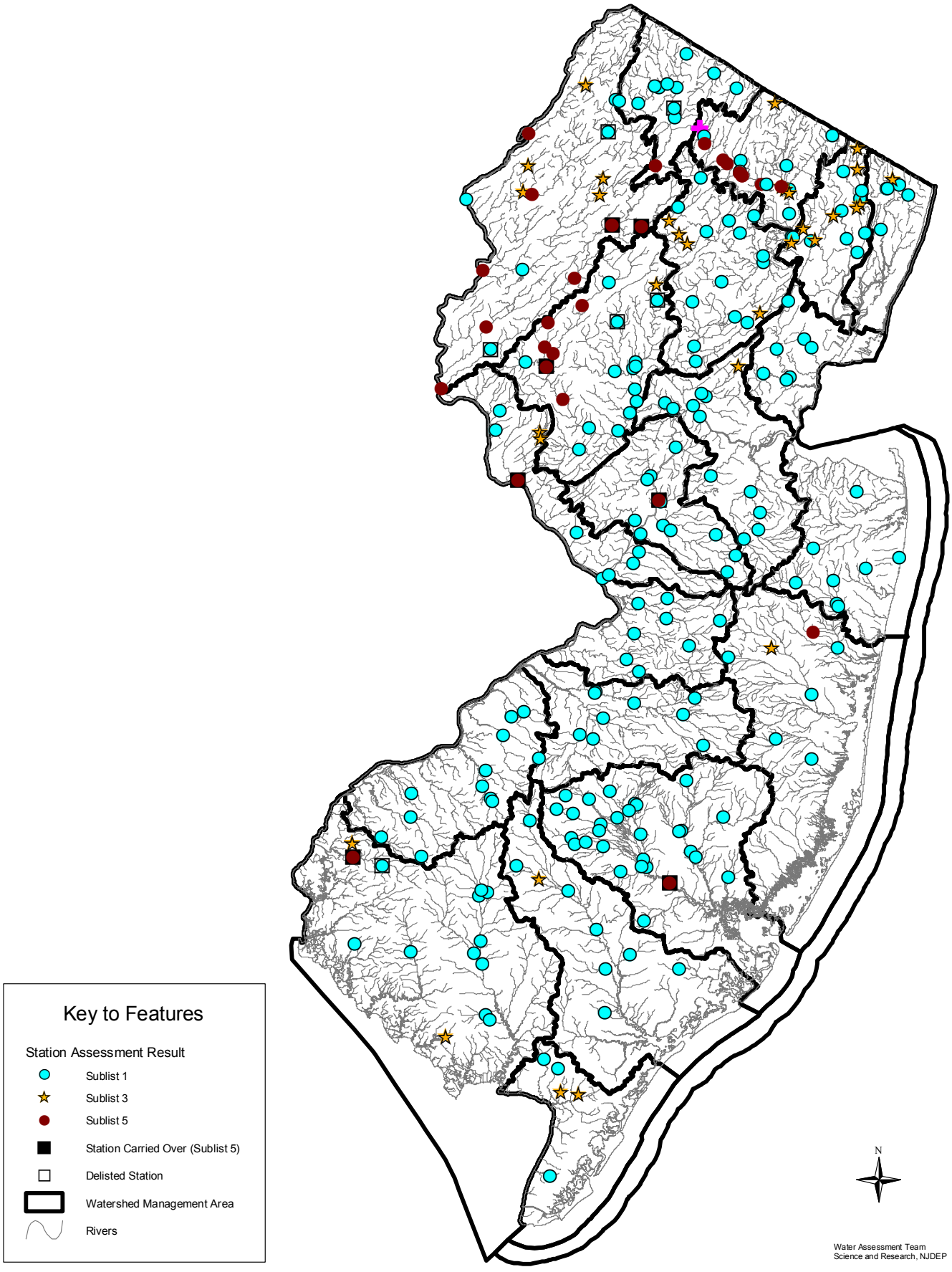
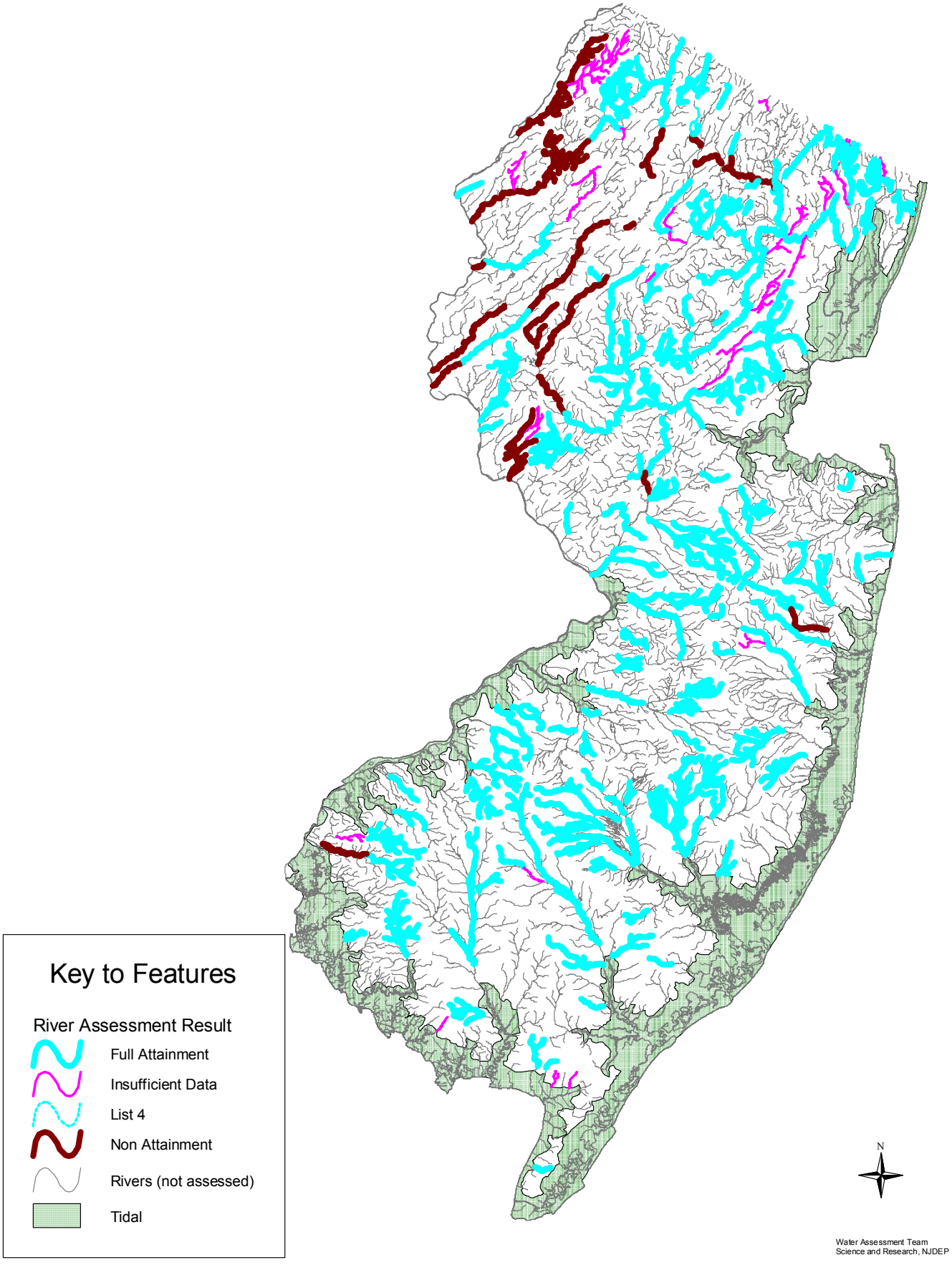


FIGURE 2.1a-8. Temperature Assessed River Segments. Includes monitored and estimated river assessments.



Ammonia Water Quality Assessment

Ammonia exists in two forms in water, ionized ammonia (NH_4^+) and unionized ammonia (NH_3). Together both forms of ammonia are called total ammonia nitrogen. Most ammonia is the ionized form used by phytoplankton and other aquatic plants as a nutrient, however, the unionized form is toxic to fish and other aquatic life. The calculation to determine the percentage of NH_3 is dependant on temperature and pH. Increasing temperature and pH levels increase the concentration of unionized ammonia. The criterion for unionized ammonia in non-trout (NT) and Pinelands waters is set at 50 parts per billion (ppb or ug/l), and in trout production (TP) and trout maintenance (TM) waters, the criterion is set at 20 ppb.

Prior to upgrades and regionalization of sewage treatment plants, ammonia exceedances were common in streams receiving effluent. Since then, the improvement of unionized ammonia concentrations in water quality statewide has been dramatic. Of the 241 stations assessed from 1996-2000, all are fully attaining the SWQS criteria for unionized ammonia (UIA). The only two stations on Sublist 5 were carried over from the 1998 303(d) List due to no new data collected at these sites (See Table 2.1a-19). Only 4 stations had any unionized ammonia violations: Wallkill River at Sparta; mouth of Hohokus Brook at Paramus; South Branch Raritan River at Stanton Station; and Paulins Kill at Blairstown. Each site had one violation with Hohokus Brook having the highest concentration of 129 ppb. Additional sampling at Hohokus Brook is needed to evaluate whether the conditions that contributed to the exceedance are reoccurring. Additionally, 12 of 14 stations were delisted from the 1998 303(d) List based upon data collected between 1996-2000 (see Table 2.1a-20). These findings are consistent with decreasing trends in total ammonia associated with reduction of ammonia in effluent. Results are summarized on Table 2.1a-18 below and provided for each station in Table II-8 in the Appendix.

Table 2.1a-18: Unionized Ammonia Status

UIA Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	224	92%	1461	465	94%	96%
Sublist 3	17	7%	84	2	5%	1%
Sublist 4	0	0%	0	0	0%	0%
Sublist 5	2	1%	12	16	1%	3%
Totals	243	100%	1557	483	100%	100%

Table 2.1a-19: UIA Stations Exceeding SWQS

WMA	Station Number	Station Name	Comments
04	01391200	Saddle River at Fairlawn	Carried over from 1998 303(d) List
11	01461300	Wickecheoke Creek at Stockton	Carried over from 1998 303(d) List

Table 2.1a-20: Delisted UIA Sites From 1998 303(d) List

WMA	Station Number	Station Name
06	01381800	Whippany River near Pine Brook
06	01382000	Passaic River at Two Bridges
04	01389500	Passaic River at Little Falls
04	01391500	Saddle River at Lodi
08	01398000	Neshanic River at Reaville
08	01399200	Lamington River near Ironia
08	01396660	Mulhockaway Creek at Van Syckel
09	01400500	Raritan River at Manville
10	01401440	Millstone River at Kingston
18	01467140	Cooper River at Lawnside
18	01467150	Cooper River at Haddonfield
17	01482500	Salem River at Woodstown

FIGURE 2.1a-9. Unionized Ammonia Station Status. Includes delisted stations and sites carried over from the 1998 303(d) List.

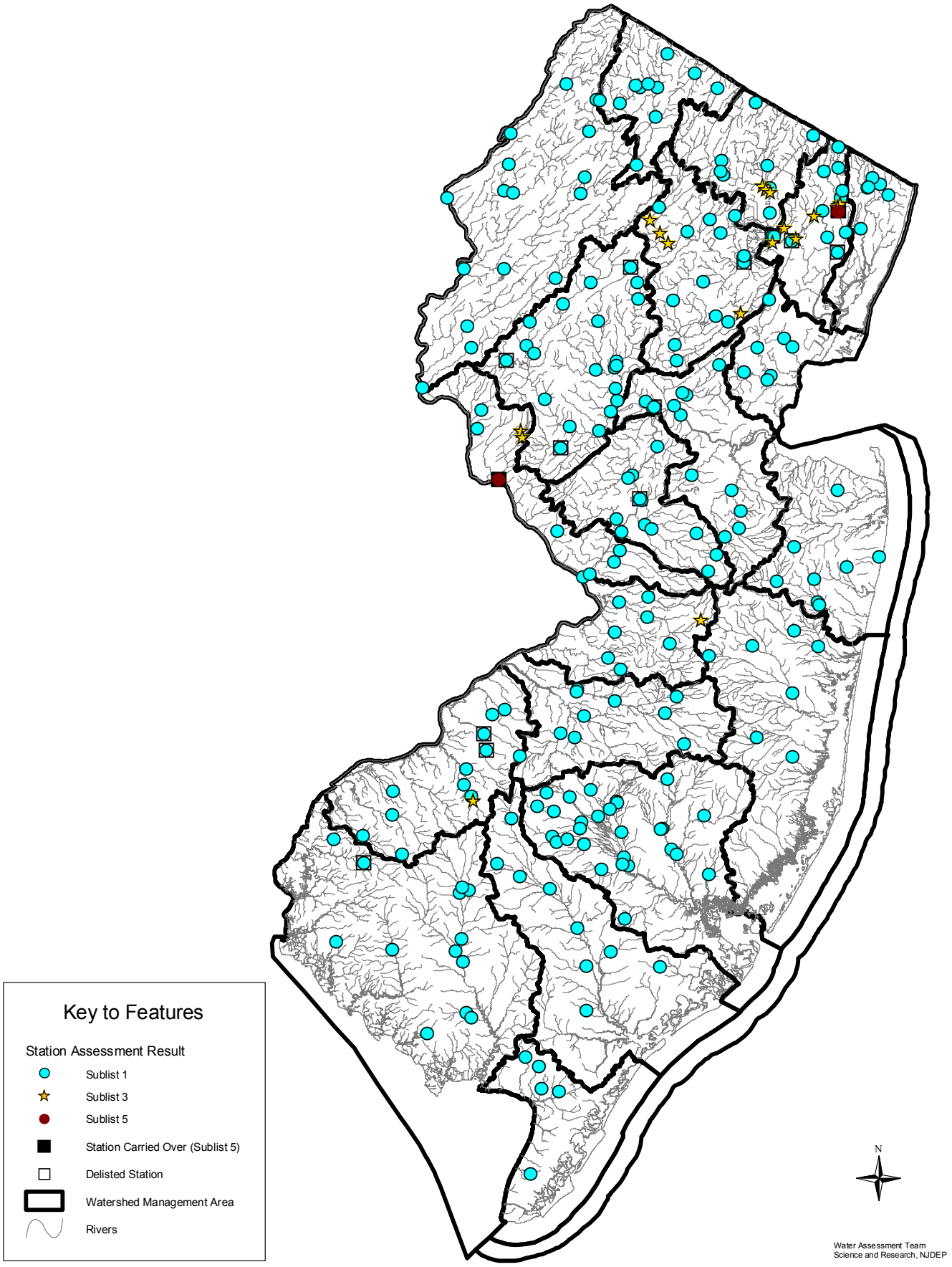
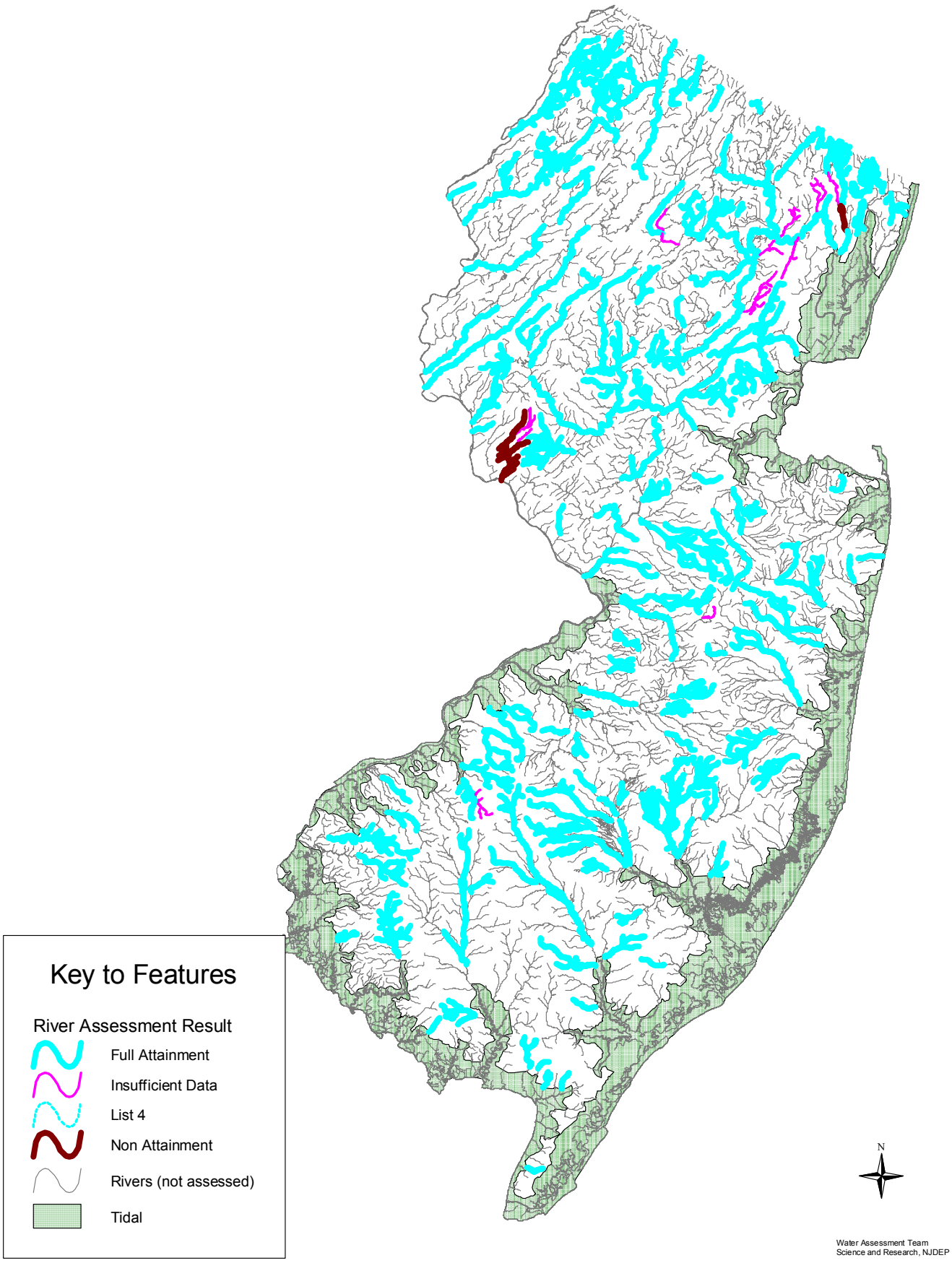


FIGURE 2.1a. Unionized Ammonia Assessed River Segments. Includes monitored and estimated river assessments.



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Total Suspended Solids Water Quality Assessment

In order to protect aquatic life from excessive sedimentation, total suspended solids (TSS) criteria were established in the NJ SWQS. TSS measures suspended sediment particles contained within the water column; specifically those particles that are retained on a 0.45 um membrane filter. TSS can consist of silt, sediment, industrial and municipal waste, and decaying plant and animal matter. It is related to turbidity. The standards for total suspended solids are: 25 mg/l for trout production and trout maintenance waters, and 40 mg/l for non trout and Pineland waters.

A total of 257 sites representing 2,022 river miles were assessed for TSS. The fully attaining sites comprise over 94% of the assessed sites, while only 6% exceed the standards for TSS, when excluding the sites with insufficient data (Sublist 3). TSS exceedances most commonly occur during high flows when erosion of streambanks and soils in runoff contribute to elevated TSS levels. This is evident at the 10 sites exceeding TSS criteria experiencing a majority of their exceedances during high flows. Consequently, stations with very little high flow data available may be masking their TSS exceedances.

The contribution of soil erosion to TSS exceedances can be noted with 8 of the 10 impacted sites located north of the Coastal Plain Region. The Coastal Plain Region is characterized by sandy soil and flat terrain that limits soil erosion into rivers and streams; whereas the other regions in the state are more susceptible to erosion. Although 2 sites with TSS exceedances are located in the Coastal Plain, they are in areas where the soil comprises mostly of clay and silt and are vulnerable to erosion. The only site on the 1998 303(d) list for TSS, Hammonton Creek at Westcoatville (which is also located in the Coastal Plain) was delisted (see Table 2.1a-23).

Results for individual stations are depicted in Figure 2.1a-11 and in Table II-6 and Table II-12 in the Appendix. Results are summarized below.

Table 2.1a-21: Total Suspended Solids Status

TSS Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	157	61%	1102	365	71%	79%
Sublist 3	90	35%	366	52	23%	11%
Sublist 4	0	0%	0	0	0%	0%
Sublist 5	10	4%	95	48	6%	10%
Totals	257	100%	1563	465	100%	100%

Table 2.1a-22: TSS Stations Exceeding SWQS

WMA	Station Number	Station Name	Number of Samples	Percent Exceed	Median TSS
06	01379200	Dead River near Millington	14	21.4%	25.6
06	01379500	Passaic River near Chatham	13	15.4%	27.2
06	01381800	Whippany River near Pine Brook	19	15.8%	16.7
08	01398000	Neshanic River at Reaville	52	11.6%	6.8
10	01400540	Millstone River near Manalapan	15	13.3%	24.7
10	01401000	Stony Brook at Princeton	35	17.0%	32.2
09	01403300	Raritan River at Queens Bridge	51	13.7%	7.2
09	01403900	Bound Brook at Middlesex	46	19.6%	39.8
01	01445500	Pequest River at Pequest	15	13.3%	16.75
18	01467081	SB Pennsauken Creek at Cherry Hill	15	13.0%	21.3

Table 2.1a-23: Delisted TSS Sites From 1998 303(d) List

WMA	Station Number	Station Name
14	01409416	Hammonton Creek at Westcoatville

FIGURE 2.1a-11. Total Suspended Solids Station Status. Includes delisted stations and sites carried over from the 1998 303(d) List.

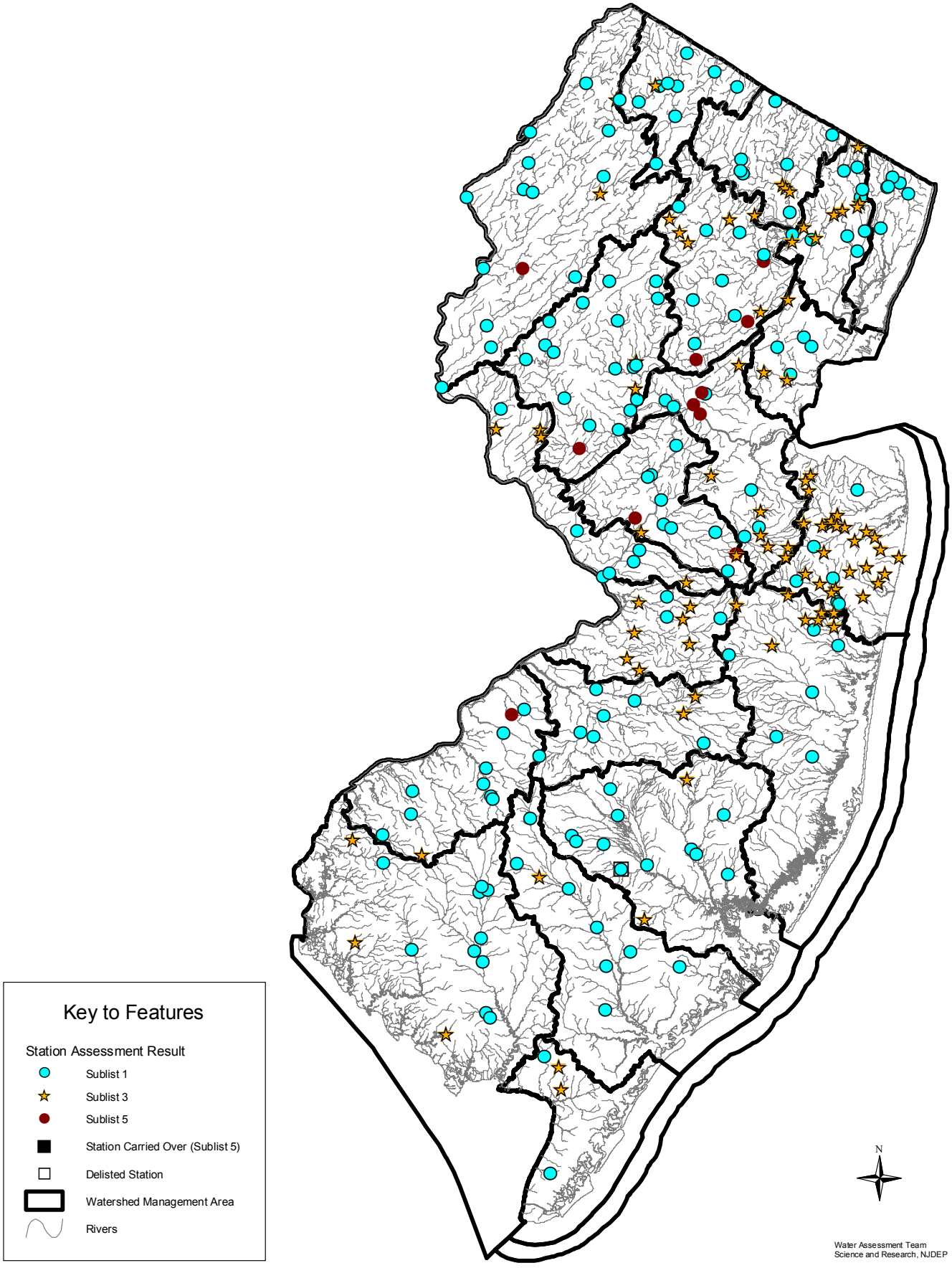
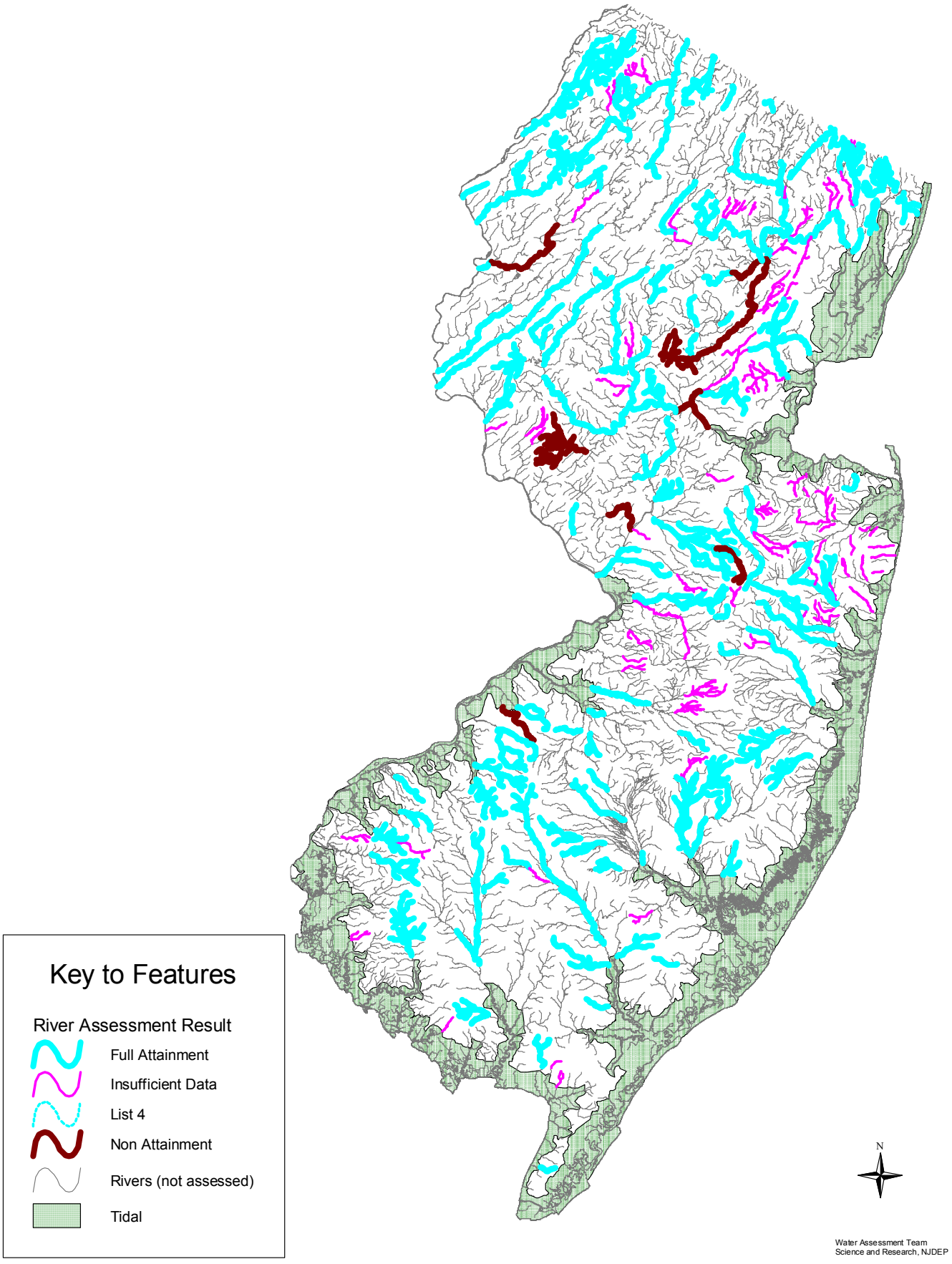


FIGURE 2.1a-12 . Total Suspended Solids Assessed River Segments. Includes monitored and estimated river assessments.



Total Dissolved Solids Water Quality Assessment

Total dissolved solids (TDS) is comprised of minerals, inorganic salts, cations, and anions dissolved in water. The chemical composition of TDS includes the principal ions such as carbonate, bicarbonate, calcium, magnesium, potassium, sodium, chloride, and sulfate. The total dissolved solids criteria, 500 mg/l, was established in the SWQS to primarily meet secondary drinking water standards.

For the assessment of total dissolved solids, 227 sites representing 1,921 river miles were evaluated. Over 98% of the stations fully met the standards for TDS when excluding sites with insufficient data. Three sites exceeded the criteria for TDS and included Elizabeth River at Ursino Lake at Elizabethtown, West Branch Rahway River at Northfield Ave. at West Orange, and East Branch Bass River near New Gretna (see Table 2.1a-25). All three sites were listed on the 1998 303(d) List. The Elizabeth River site was re-assessed using recent data verifying that conditions still are not meeting the criteria for TDS. The other two sites were carried over from the 1998 303(d) List because more recent data was insufficient for assessments. The only other site on the 303(d) list was de-listed, South Branch Rancocas Creek at Vincentown.

Assessment results for total dissolved solids are summarized in Table 2.1a-24 below. Results for individual stations are depicted in Figure 2.1a-13 and in Table II-5 in the Appendix.

Table 2.1a-24: Total Dissolved Solids Status

TDS Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	188	83%	1268	420	86%	94%
Sublist 3	36	16%	190	29	13%	6%
Sublist 4	0	0%	0	0	0%	0%
Sublist 5	3	1%	13	2	1%	>1%
Totals	227	100%	1471	451	100%	100%

Table 2.1a-25: Stations with Exceedences of TDS

WMA	Station Number	Station Name	Number of Samples	Percent Exceedance	TDS Maximum
07	01393450	Elizabeth River at Ursino Lake at Elizabethtown	15	20.0%	1440.0
07	01393960	WB Rahway River at Northfield Ave at West Orange	1998 303(d) List		
14	01410150	EB Bass River near New Gretna	1998 303(d) List		

Table 2.1a-26: Delisted TDS Sites From 1998 303(d) List

WMA	Station Number	Station Name
19	01465850	SB Rancocas Creek at Vincentown

FIGURE 2.1a-13. Total Dissolved Solids Station Status. Includes delisted stations and sites carried over from the 1998 303(d) List.

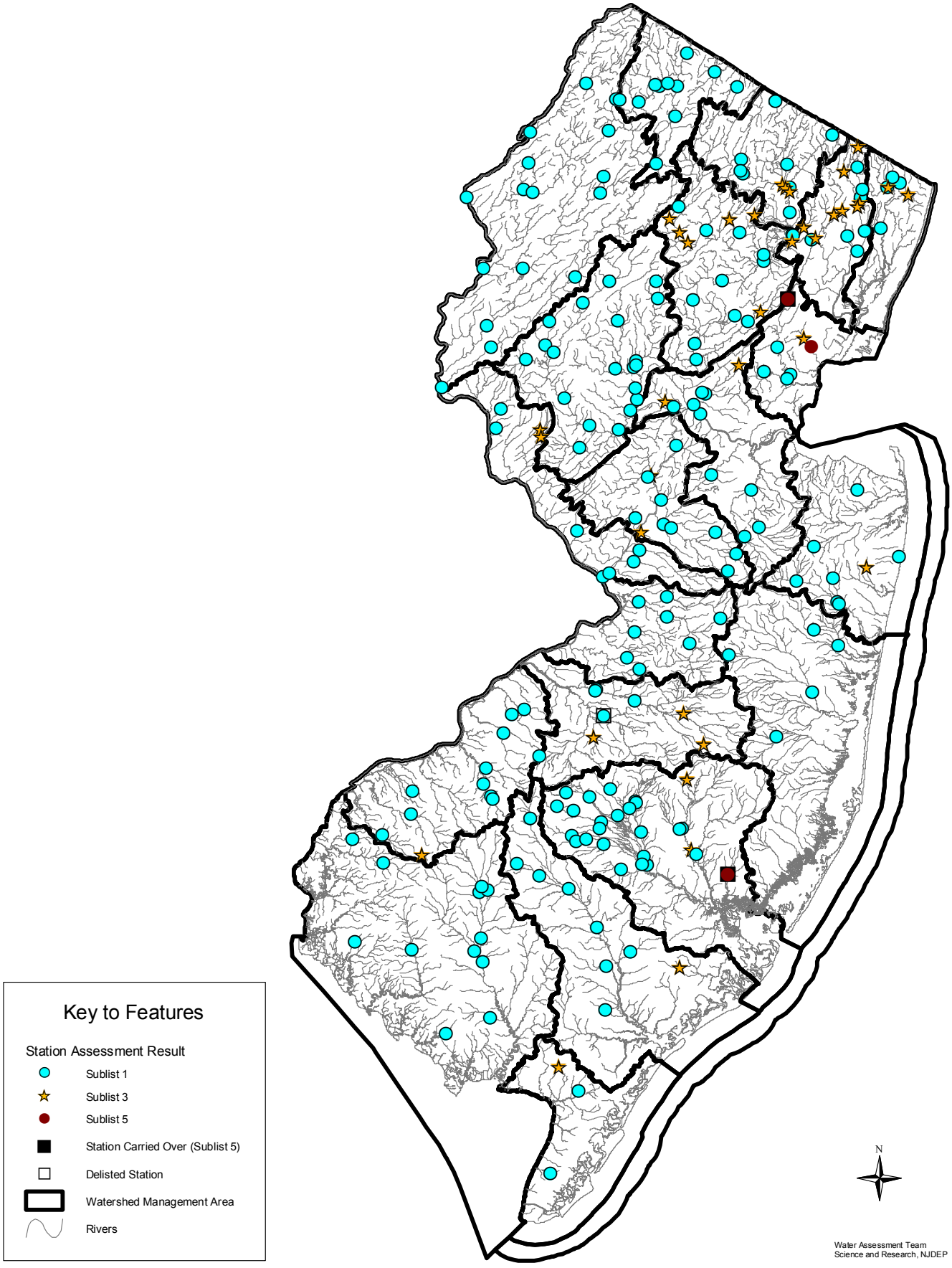
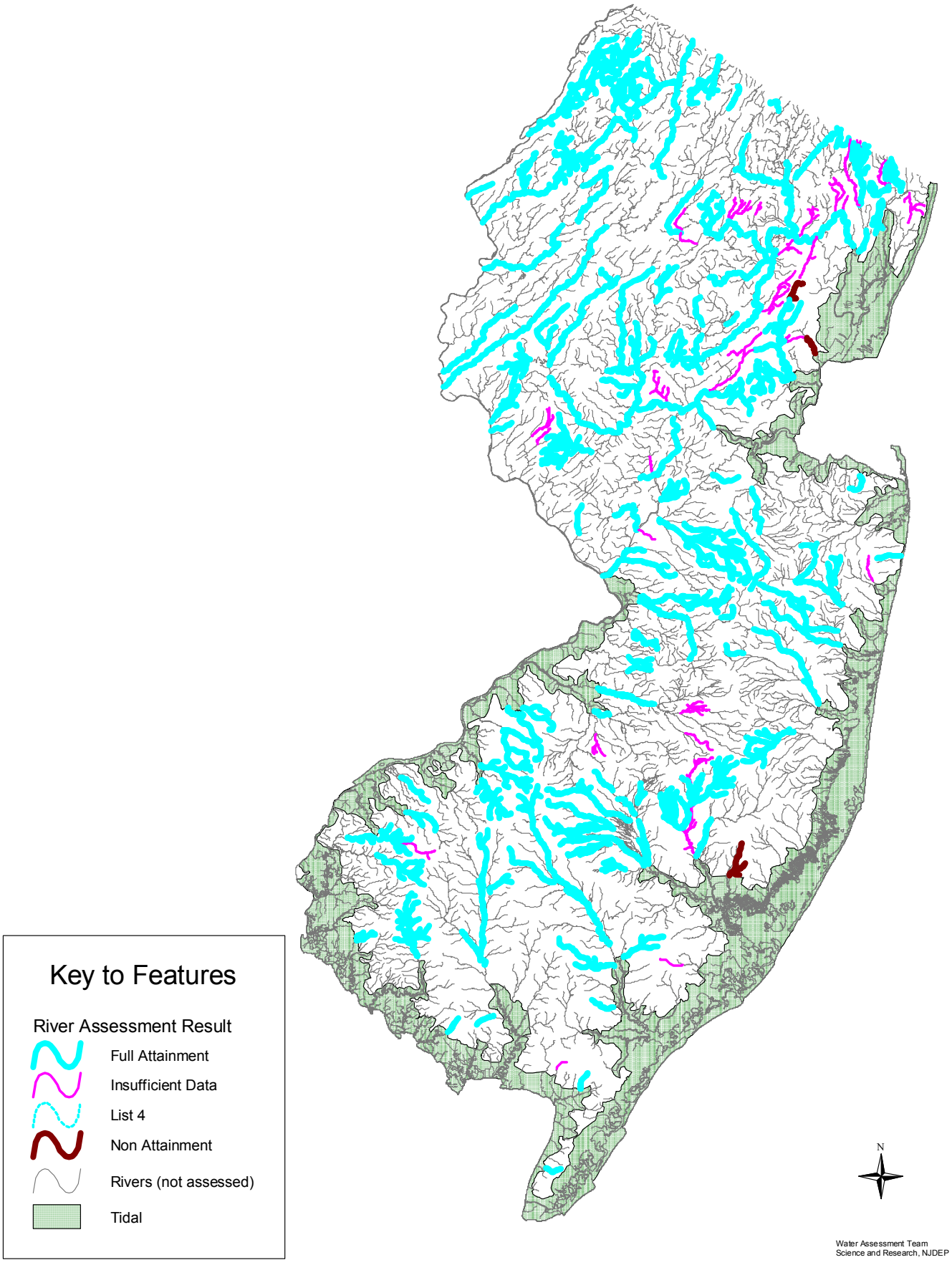


FIGURE 2.1a-14. **Total Dissolved Solids Assessed River Segments**. Includes monitored and estimated river assessments.



Fecal Coliform Water Quality Assessment
See the Recreational Designated Use Assessment in Chapter 3, Section 3.1.B.

Nitrate Water Water Quality Assessment
See the Drinking Water Designated Use Assessment in Chapter 3, Section 3.1.C.

Source Assessment For Conventional Parameters
Total Phosphorus Source Assessment
As discussed above, elevated TP may contribute to excessive primary productivity in streams, lakes and reservoirs. Additional data and assessments are needed to evaluate whether excessive primary production is occurring and contributing to use impairments in streams. Eutrophic conditions have been found in 47 of 117 assessed public lakes.

Potential sources of nutrients (including TP) include domestic sewage effluent, agricultural runoff, municipal stormwater, golf courses, waste disposal, septic systems, sediment flux, air deposition, and contaminated groundwater. These sources were identified using water quality data, field observations and best professional judgement. This source assessment is considered preliminary. Further assessments will be done to evaluate relationships between flow, nutrients and primary productivity in rivers, lakes and reservoirs and to evaluate point and nonpoint source contributions to TP exceedances as TMDLs are planned, developed and implemented.

Relative Contributions of Point and Non-Point Sources- Under contract to NJDEP, USGS conducted a study to evaluate the relative contributions of point and nonpoint sources of pollution to freshwater streams. (USGS, 1999) The study included a statistical evaluation of water quality data collected between 1976 and 1993 in the Ambient Stream Monitoring Network (ASMN) at 79 stations. Water quality data for 20 parameters collected under high and low flow conditions were used to indicate the relative contribution of constant sources (i.e., point sources and groundwater inflow) and intermittent sources (i.e., nonpoint and stormwater sources).

Relative contributions of point and nonpoint sources to total phosphorus concentrations from the USGS study indicate that point sources contribute relatively more total phosphorus at 15 locations (20%), nonpoint sources contribute relatively more total phosphorus at 12 locations (16%) and both point and nonpoint sources are important at 46 locations (63). The results of this study provide a general indication of relative contributions of point and nonpoint sources. However, additional assessment and modeling will be conducted to evaluate indicators of excessive primary productivity issues in the watersheds and to develop TMDLs as needed.

As discussed previously, total phosphorus is a limiting nutrient in many freshwater systems and can contribute to excessive primary production (i.e., growth of aquatic algae and vegetation). In saline waters (i.e., salinity greater than 3 ppt), nitrogen is usually the limiting nutrient. Therefore, TP loads from point and non-point sources in estuarine and ocean waters are not likely to contribute to excessive primary productivity in coastal waters. Nitrogen loads to these waters may warrant additional investigation as a contributor to periodic low DO in the summer.

Elevated TP in Bottom Sediments- Between 1995 and 1997, streambed sediments were sampled once at 33 stations in the ASMN. The concentrations ranged from 40 parts per million (ppm) TP

to 4,200 ppm TP; the average concentration was 510 ppm TP. Concentrations in sediments are significantly higher than those in the water column.

TP Management Measures: Currently, NJDEP has included total phosphorus monitoring requirements or limits in NJPDES permits for 157 facilities that discharge treated effluent to freshwater rivers. In addition, the USDA is developing a policy to reduce or eliminate manure applications to farms based on TP concentrations in soils and TP needs of crops. The CREP program is expected to facilitate installation of buffer strips in 30,000 acres along agricultural stream corridors, further reducing TP runoff from agriculture. As TMDLs are planned and developed, areas with excessive primary productivity will be identified and targeted for management measures, including as appropriate, TP reduction strategies (see 2 year TMDL Schedule and Priority Listing in Appendix 1C and 1B).

pH Source Assessment

pH measurements that are outside acceptable criteria ranges may occur because of natural conditions (e.g., naturally acidic soils) or due to runoff of liming agents and nutrients from fertilizer, failing septics, animal wastes, or point source dischargers. Additional assessments are needed to identify pH excursions attributable to natural conditions from those caused by pollution. Normally, anthropogenic inputs tend to increase pH levels except for a few industries that may discharge acidic by-products. This may explain why the majority of impacted sites have elevated pH measurements, except for waterways surrounding the Pinelands.

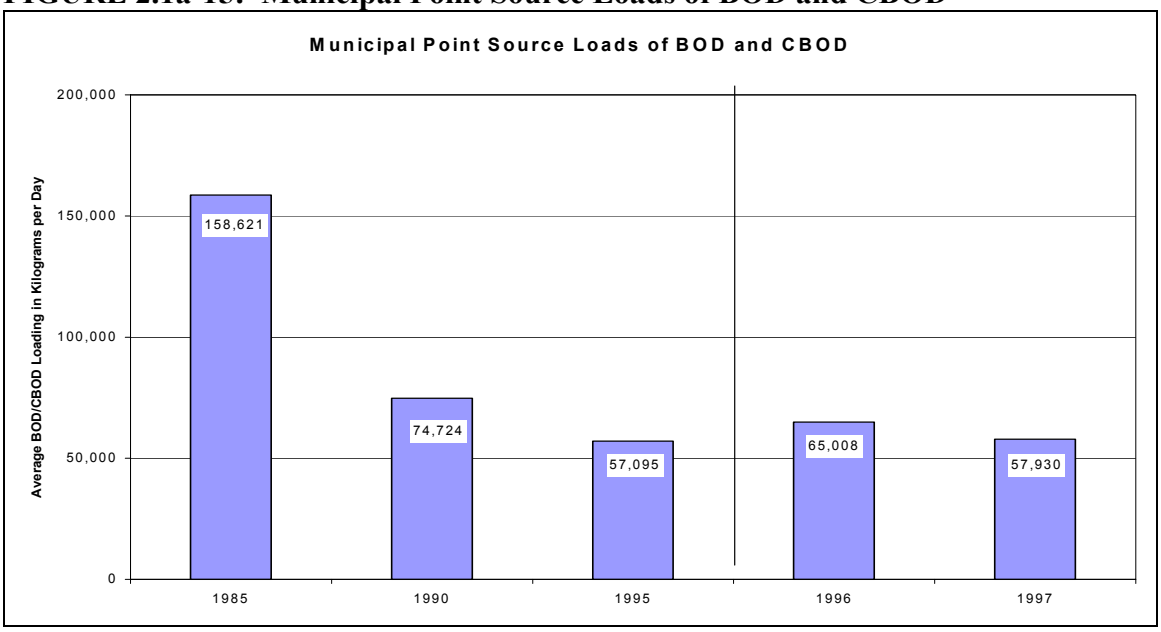
pH Management Measures: Areas that exhibit contravention of SWQS, with respect to pH, will be evaluated as TMDLs are planned and developed. The factors that contribute to these contraventions will be identified and managed according to the schedule developed in TMDL Memorandum of Agreement (see 2 year TMDL Schedule and Priority Listing in Appendix 1C and 1B). As mentioned earlier, the Department will study technical approaches to determine if site specific pH criteria are needed for the waters surrounding the Pinelands.

Dissolved Oxygen Source Assessment

Potential causes of exceedances of DO criteria include temperature, flow, eutrophication, biochemical oxidation demand (BOD) and chemical oxidation demand (COD). Further assessment will be done to evaluate point and nonpoint source contributions to DO exceedances as TMDLs are planned, developed and implemented.

Municipal Point Source Loads of BOD Indicator**:** Biochemical Oxygen Demand (BOD) indicate the amount of oxygen needed for biological degradation of organic materials in water and wastewater. Excessive BOD loadings from point and nonpoint sources may reduce ambient dissolved oxygen levels, stressing the aquatic community. As shown on Figure 2.1a-15, municipal point source BOD levels have decreased as a result of the Federal mandate for secondary treatment in 1988. As a result of improved wastewater treatment operations, BOD loadings have been relatively stable since 1990, although the number of residents in sewered areas has increased. Additional detail is available from the NEPPS Environmental Indictor Technical Report. (NJDEP, 1997 and www.state.nj.us/dep/dsr).

FIGURE 2.1a-15: Municipal Point Source Loads of BOD and CBOD



USGS evaluated 1998 in-stream BOD data from the Redesigned Ambient Stream Monitoring Network. Results from quarterly sampling were grouped by land use: background, forest, agricultural, and urban. Results show that median levels for all land use types were below 2 mg/l BOD, however, in urban areas in-stream BOD sometimes exceeded 10 mg/l BOD. Point and nonpoint source contribution to these in-stream levels will be evaluated further through TMDL development.

Temperature Source Assessment

Development in and around waterways is perhaps the primary source of temperature criteria exceedances in the state. Development can bring about the reduction or elimination of vegetation and trees in riparian zones that are needed to shade and cool the rivers, and building of impervious surface in the watershed can increase surface temperatures causing rising water temperatures. Development of waterways may include the damming of streams creating ponds and lakes that increase surface water area and consequently water temperatures. Currently, there are less than 50 lakes in the state that are natural. Finally, potential sources may include thermal inputs by point source dischargers such as cooling water

Temperature Management Measures: Areas that exhibit contraventions of SWQS, with respect to temperature, will be evaluated as TMDLs are planned and developed. The factors that contribute to these contraventions will be identified and managed according to the schedule developed in the TMDL Memorandum of Agreement (see 2 year TMDL Schedule and Priority Listing in Appendix 1C and 1B).

UIA Source Assessment

Exceedance of unionized ammonia (UIA) normally does not occur naturally. Most sources of criteria exceedances occur from failures in wastewater treatment plants or septics, runoff especially from animal feed lots, or possibly discharges from point sources.

UIA Management Measures: Further sampling at the two impacted sites will be explored to determine if high UIA conditions still exist. Areas that exhibit contraventions of SWQS, with respect to UIA, will be evaluated as TMDLs are planned and developed. The factors that contribute to these contraventions will be identified and managed according to the schedule developed in the TMDL Memorandum of Agreement (see 2 year TMDL Schedule and Priority Listing in Appendix 1C and 1B).

TSS Source Assessment

Elevated TSS may occur naturally in watersheds with highly erodable soils. Elevated TSS may also be caused by stream bank and streambed erosion and runoff due to land disturbance, stormwater discharges, and other flow-related conditions. Point source dischargers are also potential contributers to total suspended solids and to a smaller extent decaying plants and animals. Additional assessments are needed to evaluate potential causes of elevated TSS in the 10 locations identified in this assessment.

TSS Management Measures: Areas that exhibit contraventions of SWQS, with respect to TSS, will be evaluated as TMDLs are planned and developed. The factors that contribute to these contraventions will be identified and managed according to the schedule developed in the TMDL Memorandum of Agreement (see 2 year TMDL Schedule and Priority Listing in Appendix 1C and 1B).

TDS Source Assessment

Elevated TDS can occur naturally such as from runoff as it flows over rocks and soils, salt water intrusions, or mineral springs. On the other hand, TDS exceedances have been associated with urban runoff, runoff from agricultural areas, wastewater treatment discharges, failing septics, and decaying plants and animals. Further assessment will be done to evaluate point and nonpoint source contributions to DO exceedances as TMDLs are planned, developed and implemented.

TDS Management Measures: Further sampling at the two impacted sites, carried over from the 1998 303(d) List, will be explored to determine if high TDS conditions still exist. Areas that exhibit contraventions of SWQS with respect to TDS will be evaluated as TMDLs are planned and developed. The factors that contribute to these contraventions will be identified and managed according to the schedule developed in the TMDL Memorandum of Agreement (see 2 year TMDL Schedule and Priority Listing in Appendix 1C and 1B).

Section 2.1b. Metals

Metals, also referred to as trace elements, are a high priority issue in New Jersey due to the historical and present use of metals in the state and its persistence in the environment. The hazardous impact of metals on human and aquatic life are also well-known and continues to be a concern. The metals assessed for the 2002 Integrated List include the following parameters: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

Prior exceedances of the SWQS for metals in non-tidal rivers have been documented at 69 sites on the 1998 303(d) List with many of the sites having multiple metals exceeding the standards. These 69 sites are now represented by 84 sampling stations on the 2002 Integrated List. Since the 1998 303(d) List was published, new data sampling for metals has occurred (see Data Sources below). As a result of the new data collection, a total of 142 individual metal listing (43% of the metal listings on the 1998 303(d) List) from the 84 sampling sites were delisted from the 1998 303(d) List after new data confirmed that conditions met the SWQS. 35 metal listing were found to continue to have exceedances of metal standards, and 152 listing were carried over from the 1998 303(d) List due to no new data available or insufficient data to make a new assessment. The primary reason many of the sites did not have sufficient data for assessments was the lack of high flow data. Currently, EPA and NJDEP are in the process of collecting high flow data at these sites.

For the 2002 Integrated List, 111 stations representing 1,131 river miles were assessed with 502 river miles exceeding a standard for at least one metal. As seen in Figure 2.1b-1, lead, arsenic, copper, and mercury had the highest impairment of river miles in non-tidal waterways. Arsenic and lead also had the highest percentage of sites on sublist 5, both with 44% of sampling sites exceeding their criteria.

Several sites were excluded from the 2002 metals assessment because these sites could not be located on the GIS maps and therefore the river miles could not be calculated (see Table 2.1b-1 below).

Table 2.1b-1: Metal Sites excluded from Assessment Results

WMA	Station Name	Metals
05	Ackermans Creek Adjacent to Berry's Creek Reach 02030103-034-0.11	Chromium, Mercury, PCB, Chlorinated Benzenes
12	Birch Swamp Brook Adjacent to Matawan Creek Reach 02030104-328-0.42	Arsenic, Lead, Copper, PCB
08	Cakepoulin (Capoloony) Creek Reach 02030105-043-0.00	DDT
09	Edmunds Creek Adjacent to Mill Brook at 02030105-059-0.00	PCB

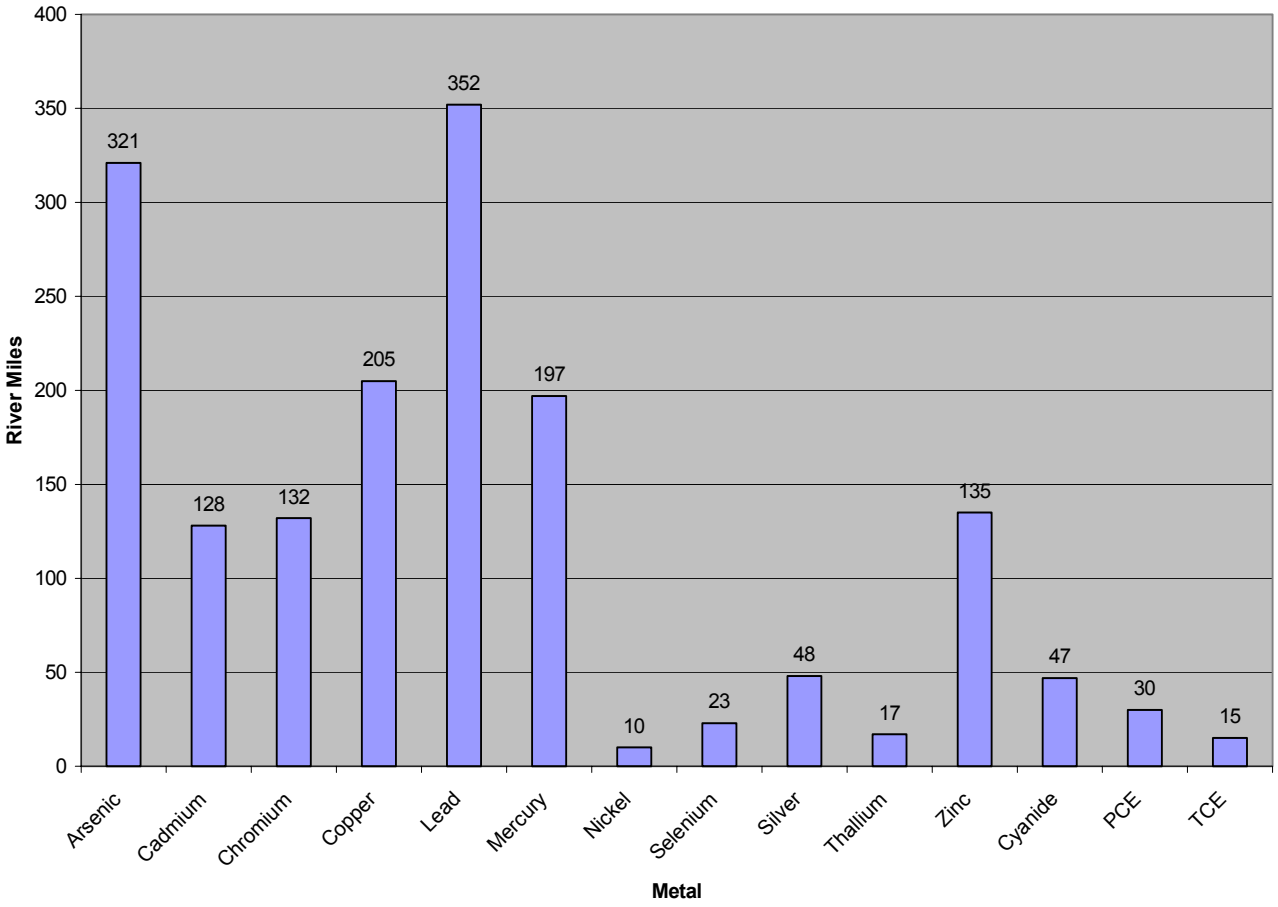


FIGURE 2.1b-1. River Miles with Metal Exceedances. Graph based on 14 metals listed on the 1998 303(d) List in non-tidal rivers

Data Sources

Historically, data assessed for metal impairments in freshwaters were generated primarily from the 1990 Assessment of Waters Impaired by Toxic Pollutants (NJDEP, 1990) also known as the 304(l) List; and, to a lesser extent, the NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN). Since many waterbodies had data based on water quality and effluent data collected in the early and mid-1980's, the need to reassess water quality for metals has been a high priority issue. In order to address this need, data collection commenced in 1998 with the 303d Evaluation Monitoring Network, as well as, continued data collection in the ASMN and Redesigned ASMN. These data have provided much needed information in the determination of the status of metals in the state's waterways.

See Appendix II, Data Sources for the 2002 NJ Integrated Report for details of the monitoring networks. Below are the data network sources for metals on the 2002 Integrated List:

- 303d Evaluation Monitoring (99 sites) – Primary source of new metal data. Targeted sites on the 1998 303(d) for metals. Sampled between 1998 to 2001. 12 sites did not have high flow data available to complete the assessment.

- NJDEP/USGS Ambient Stream Monitoring Network (ASMN) (76 sites) –These sites were sampled prior to 10/97.

- NJDEP/USGS Redesigned Ambient Stream Monitoring Network (Redesigned ASMN) (73 sites) – implemented in October, 1997. Only one sample available. Since these sites lacked the data required for an assessment, they were not included in this report. However, 2 sites with extremely elevated metal concentrations along with 4 background sites with 3 samples available were included in the evaluation of metals.

Historical use of sample collection and analyses procedures that, while acceptable at the time, were less rigorous than current procedures may have resulted in overestimating concentrations of some metals. In addition, metals were monitored less frequently than conventionals (2 samples every 3 years), so fewer data points were available for listing decisions. Improvements have been made to water quality criteria for metals, including the conversion of most aquatic life criteria for metals from total recoverable to dissolved metals. Most available metals data were total recoverable metal. Thus, some waterbodies were identified as impaired because concentrations of total recoverable metals were above dissolved criteria. See the Integrated Assessment and Listing Methodology Report, Section 4.2.2, Metal Assessment (in non-tidal waters), for a detailed explanation of the new sampling protocol.

Water Quality Criteria for Metals

Criteria for the protection of human health, acute aquatic life, and chronic aquatic life must all be met in order for a metal to meet its designated use. Some aquatic life criteria are hardness-dependant, and decrease as water hardness decreases. Criteria were calculated using hardness at the time of sampling. See Table 2.1b-2 for SWQS metals criteria.

Some aquatic life criteria are based on the dissolved form of the metal. In the 303d Evaluation Monitoring, samples were analyzed for both total recoverable and dissolved metals. In the Ambient Stream Monitoring Network (ASMN) and Redesigned Network (Redesigned ASMN), only total recoverable metals were analyzed. This approach was used because review of historical data has shown that total recoverable metals were not detected at many locations; concentrations of dissolved metals are lower than total metals. For evaluations of previously listed waterbodies, an impairment was identified if the concentration of total recoverable metal exceeded the dissolved criterion, providing a conservative assessment. In these cases, collection of additional data on both total and dissolved metals concentrations is anticipated as part of the watershed/TMDL planning.

Table 2.1b-2 provides the minimum detection limit for the 303d Evaluation Monitoring Program data, numerical criteria for metals in freshwaters in New Jersey and the form of the metal for acute criteria. All human health criteria are based on the total recoverable metal. The table shows how hardness-dependant criteria change and gives an example of low hardness (10.0 mg/l) compared to high hardness (100 mg/l)

Table 2.1b-2: SWQS Metals Criteria

Sample Hardness:		10.0		100			
SWQS	**MDL**	**HH**	**AQL(a)**	**AQL(c)**	**AQL(a)**	**AQL(c)**	**Acute Criteria Form**
Arsenic	1	0.0170	360	190	360	190	dissolved
Cadmium	1	10	0.3	0.2	3.7	1.0	dissolved
Chromium-Tot	1	160	NA	NA	NA	NA	NA
Chromium-Hex	5	NA	15	10	15	10	dissolved
Copper	1	NA	2	2	17	11	dissolved
Lead	1	5.0	5	0.19	65	2.5	dissolved
Mercury	0.04	0.14	2.1	0.012	2.1	0.012	AQLa-dissolved AQLc-total recoverable
Nickel	1	516	202	22	1415	157	dissolved
Selenium	3	10	20	5.0	20	5.0	total recoverable
Silver	1	164	0.07	NA	3.4	NA	dissolved
Thallium	1	1.70	NA	NA	NA	NA	NA
Zinc	2	NA	16	15	114	105	dissolved

Calculated Concentration Factors

SWQS	AQL(a)	AQL(c)	AQL(a)	AQL(c)
Cadmium	1.04	1.01	0.94	0.91
Lead	1.13	1.13	0.79	0.79

Notes:
SWQS Criteria in ug/l
MDL: Method Detection Limit
HH: Human Health Criterion; compare to Total Recoverable data
AQL(a): Acute Aquatic Life Criterion; Compare to Dissolved data
AQL(c): Chronic Aquatic Life Criterion; Compare to Dissolved data
Formulae used to calculate aquatic life criteria are available from the Surface Water Quality Standards Program.
Criteria for Aluminum, Beryllium and Iron have not been adopted.
From: Surface Water Quality Standards (N.J.A.C. 7:9B) and National Toxics Rule

Arsenic

A total of 108 sites representing 696 river miles were assessed for arsenic. Because the human health criteria is below the method detection level (MDL), no sites were placed on sublist 1 as "Full Attainment." (see the Methods Document, Section 4.2.2 for an explanation of MDLs for metals) If the data showed no exceedances, it was listed under sublist 3 as "Insufficient Data." Of the 60 sites on sublist 3, almost half of the sites (46% of sublist 3 sites) had no exceedances, but were assessed as "Insufficient Data." Almost half of the total sites (44% of stations) were assessed as "non attainment", of which 44% were carried over from the 1998 303(d) List due to insufficient data available for new assessments.

Results of the arsenic assessment are summarized below in Table 2.1b-3. Results for individual stations are depicted in Figure 2.1b-2 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-3: Arsenic Status

Arsenic Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	0	NA	0	0	NA	NA
Sublist 3	60	56%	375	0	54%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	48	44%	321	0	46%	*NA*
Totals	108	100%	696	0	100%	NA

Of the 49 stations on the 1998 303(d) List for arsenic, only 31% were delisted (see Table 2.1b-4), and 21 of 34 sites remaining on sublist 5 were carried over due to insufficient data available (see Table 2.1b-5).

Table 2.1b-4: Delisted Arsenic Sites From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
06	01381200, 6-ROC-1, 6-SITE-10	Rockaway River at Pine Brook	14	01409416, 14-HAM-2	Hammonton Creek at Westcoatville
06	01381500, 6-WHI-1	Whippany River at Morristown	15	01410784, 15-GEH-1	Great Egg Harbor River near Sicklerville
06	01381800, 6-WHI-2	Whippany River near Pine Brook	15	01411110, 15-GEH-3	Great Egg Harbor River at Weymouth
03	01387500, 3-RAM-1, 3-SITE-9	Ramapo River near Mahwah	01	01445500, 1-PEQ-2	Pequest River at Pequest
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn	01	01457000, 1-MUS-4	Musconetcong River near Bloomsbury
04	01391500, 4-SITE-12	Saddle River at Lodi	01	01457400, 1-MUS-5	Musconetcong River at Riegelsville
12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum	20	01464500, 20-CRO-1	Crosswicks Creek at Extonville
13	01408500, 13-TOM-1	Toms River near Toms River			

Table 2.1b-5: Arsenic Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name		WMA	Station Number	Station Name
05	01377000, 5-HAC-3	Hackensack River at Rivervale		17	01411800, 17-MAU-1	Maurice River near Millville
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington		01	01446400, 1-PEQ-3	Pequest River at Belvidere
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham		01	01447000,	Delaware River at Easton
06	01380500, 6-SITE-11	Rockaway River at Boonton		11	01463620, 11-AS-2	Assunpink Creek near Clarksville
06	01382000, 6-SITE-3	Passaic River at Two Bridges		18	01467081, 18-PE-3	SB Pennsauken Creek at Cherry Hill
04	01389130, 4-PAS-4	Passaic River at Sigac		10	10-STO-3	Stony Brook on Mine Rd in Hopewell Twp.
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls		11	11-AS-4	Assunpink Creek at Route 535
04	01389880, 4-SITE-5	Passaic River at Elmwood Park		20	20-AS-1	Assiscunk Creek at Cedar Lane in Springfield
08	01398102, 8-SB-6	SB Raritan River at South Branch		09	9-LAW-1	Lawrence Brook at Davidsons Mill Rd in Black Horse
10	01401440, 10-MIL-2	Millstone River at Kingston		10	South River	South River
15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom				

FIGURE 2.1b-2. Assessment Status of Stations Monitored for Arsenic. Includes sites delisted and carried over from the 1998 303(d) List.

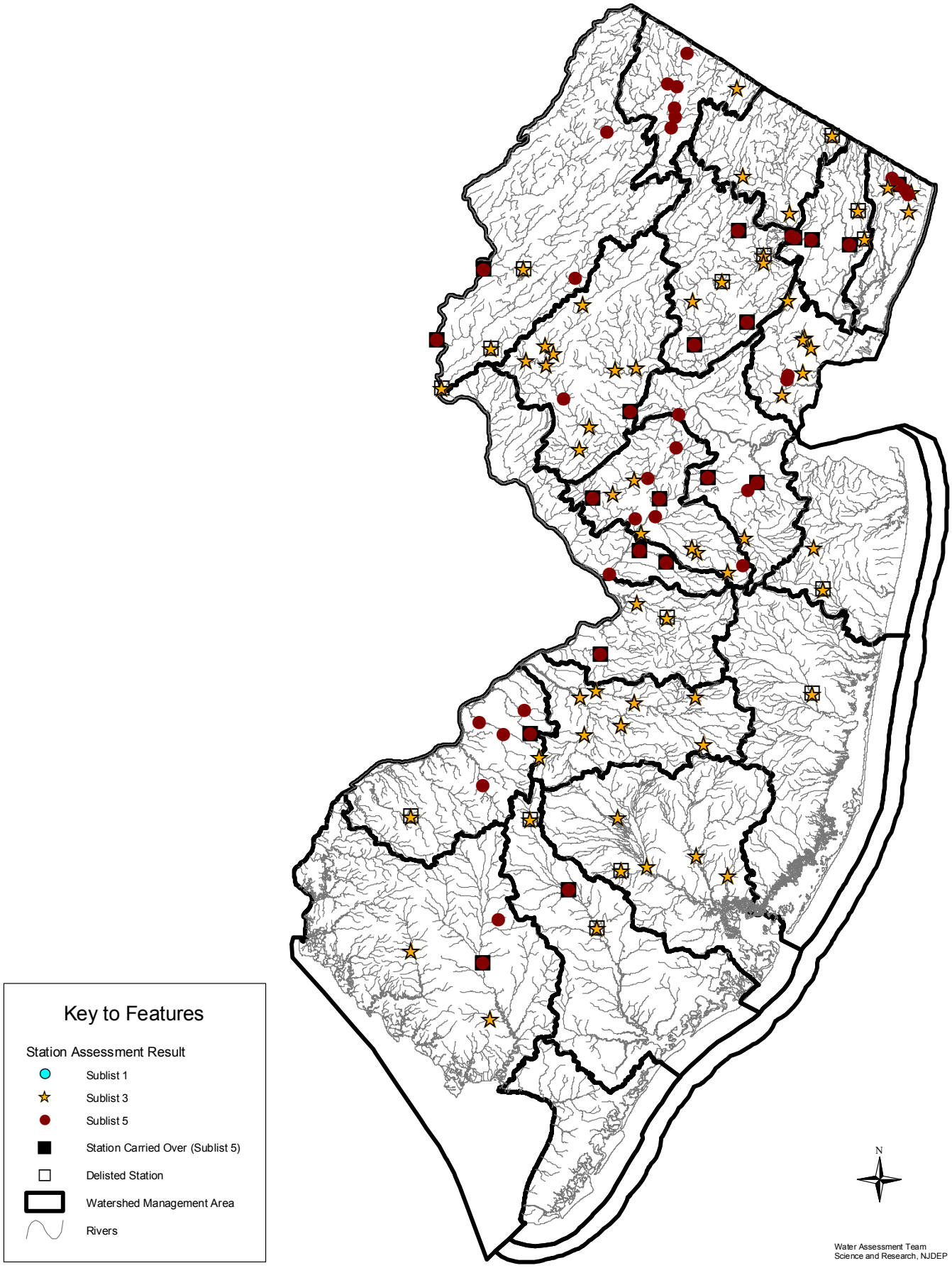
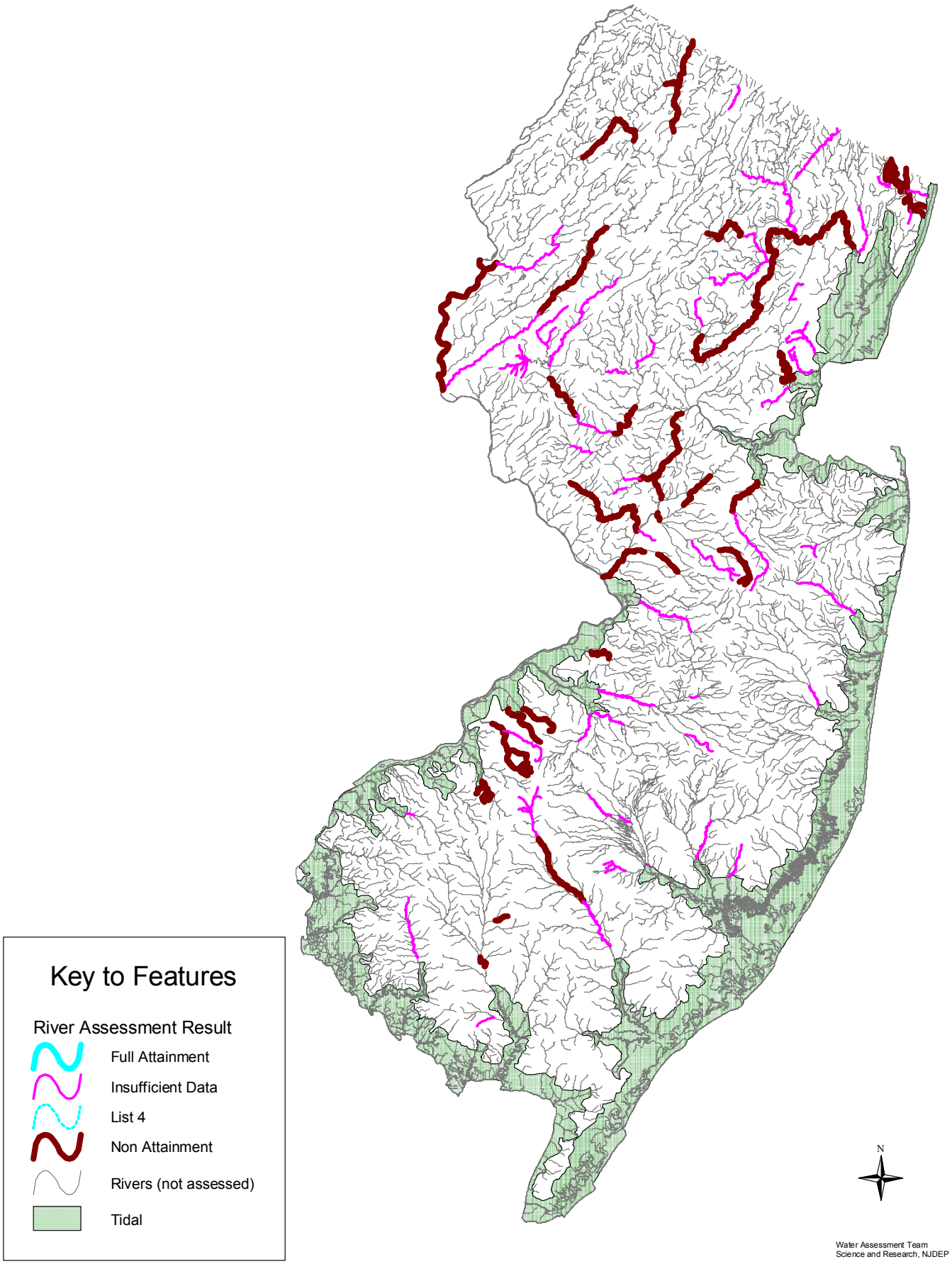


FIGURE 2.1b-3. Assessment Status for Arsenic in Rivers.



Cadmium

A total of 107 sites representing 683 river miles were assessed for cadmium. At low hardness levels, the criteria for cadmium is below the method detection level (MDL) and is therefore assessed as "Insufficient Data" although no exceedances of the criteria are detected (see the Methods Document, Section 4.2.2 for an explanation of MDLs for metals). As a consequence, over 77% of sites are on sublist 3. Of the 82 sites on sublist 3, almost half of the sites (45% of sublist 3 sites) had no exceedances, but were assessed as "Insufficient Data." Only 16% of the sites were assessed as "non attainment", of which all were carried over from the 1998 303(d) List due to insufficient data available for new assessments.

Results of the cadmium assessment are summarized below in Table 2.1b-6. Results for individual stations are depicted in Figure 2.1b-4 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-6. Cadmium Status

Cadmium Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	8	7%	77	0	11%	NA
Sublist 3	82	77%	478	0	70%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	17	16%	128	0	19%	NA
Totals	107	100%	683	0	100%	NA

Of the 39 stations on the 1998 303(d) List for cadmium, 56% were delisted (see Table 2.1b-7) with 7 sites fully attaining standards and 15 sites found to have no exceedances but the criteria was below the MDL. The sites remaining on sublist 5 were all carried over due to insufficient data available (see Table 2.1b-8).

Table 2.1b-7. Delisted Cadmium Sites From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn	10	01402000, 10-MIL-5, 10-MIL-6	Millstone River at Blackwells Mills
04	01391500, 4-SITE-12	Saddle River at Lodi	10	01402540, 10-MIL-3	Millstone River at Weston
01	01443440, 1-PAU-1	Paulins Kill at Balesville	12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum
01	01445500, 1-PEQ-2	Pequest River at Pequest	13	01408500, 13-TOM-1	Toms River near Toms River
01	01456200, 1-MUS-3	Musconetcong River at Beattystown	14	01409416, 14-HAM-2	Hammonton Creek at Westcoatville
01	01457000, 1-MUS-4	Musconetcong River near Bloomsbury	15	01410784, 15-GEH-1	Great Egg Harbor River near Sicklerville
01	01457400, 1-MUS-5	Musconetcong River at Riegelsville	15	01411110, 15-GEH-3	Great Egg Harbor River at Weymouth
06	01381200, 6-ROC-1, 6-SITE-10	Rockaway River at Pine Brook	11	01464020, 11-AS-3	Assunpink Creek at Peace Street at Trenton
06	01381500, 6-WHI-1	Whippany River at Morristown	18	01467150, 18-CO-4	Cooper River at Haddonfield
08	01396660, 8-MU-1	Mulhockaway Creek at Van Syckel	18	01477120, 18-RAC-1	Raccoon Creek near Swedesboro
10	01400540, 10-MIL-1	Millstone River near Manalapan	18	18-CO-1	Cooper River at Rte 130 in Camden

Table 2.1b-8 Cadmium Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington	01	01446400, 1-PEQ-3	Pequest River at Belvidere
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham	01	01447000	Delaware River at Easton
06	01380500, 6-SITE-11	Rockaway River at Boonton	11	01463620, 11-AS-2	Assunpink Creek near Clarksville
04	01389130, 4-PAS-4	Passaic River at Sigac	10	10-STO-3	Stony Brook on Mine Rd in Hopewell Twp.
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls	11	11-AS-4	Assunpink Creek at Route 535
04	01389880, 4-SITE-5	Passaic River at Elmwood Park	20	20-AS-1	Assiscunk Creek, Cedar Lane, Springfield
08	01396800, 8-SP-1	Spruce Run at Clinton	09	9-LAW-1	Lawrence Brook at Davidsons Mill Rd at Black Horse
10	01401440, 10-MIL-2	Millstone River at Kingston	10	South River	South River
15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom			

FIGURE 2.1b-4. Assessment Status of Stations Monitored for Cadmium. Includes sites delisted and carried over from the 1998 303(d) List.

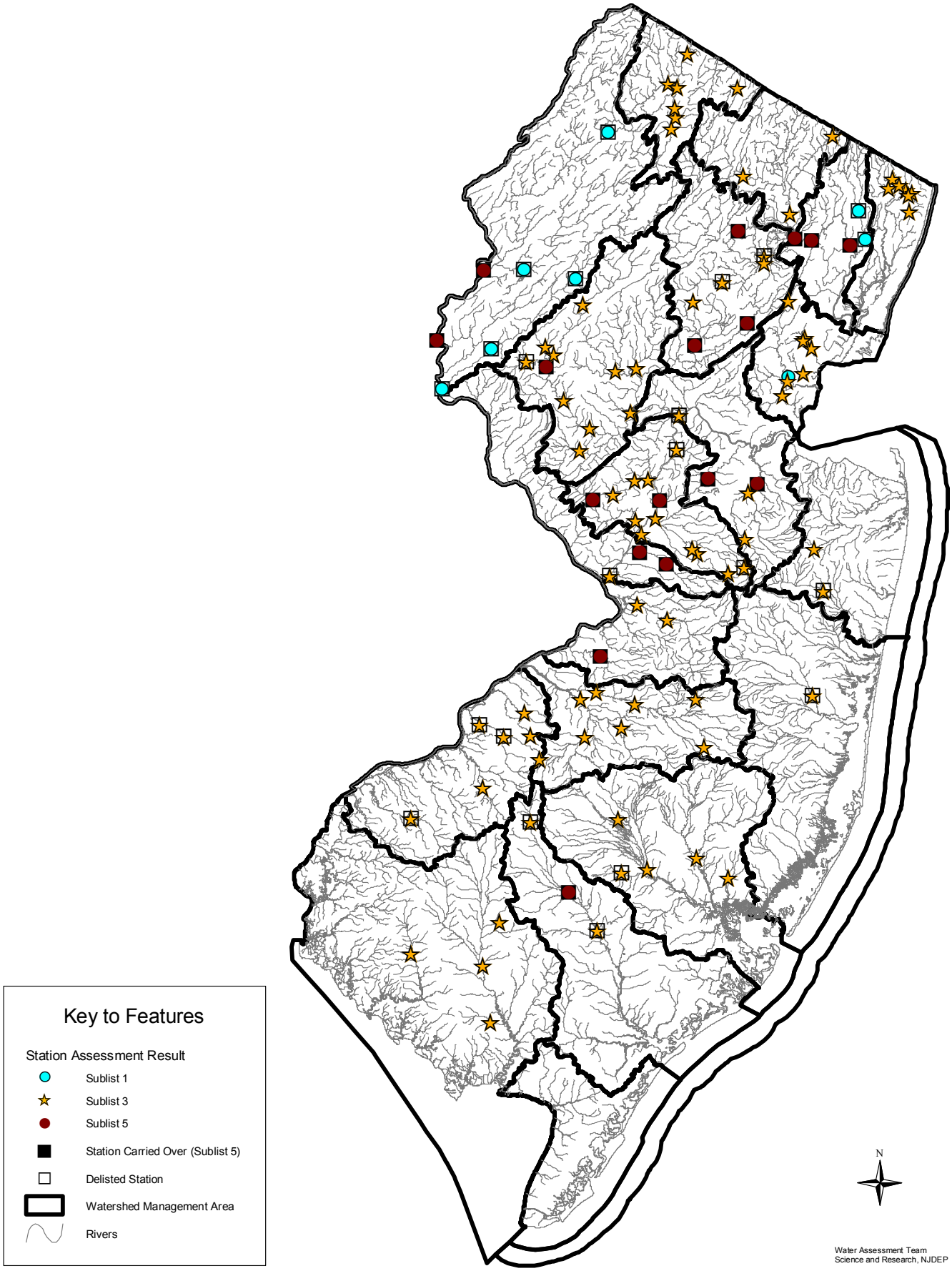
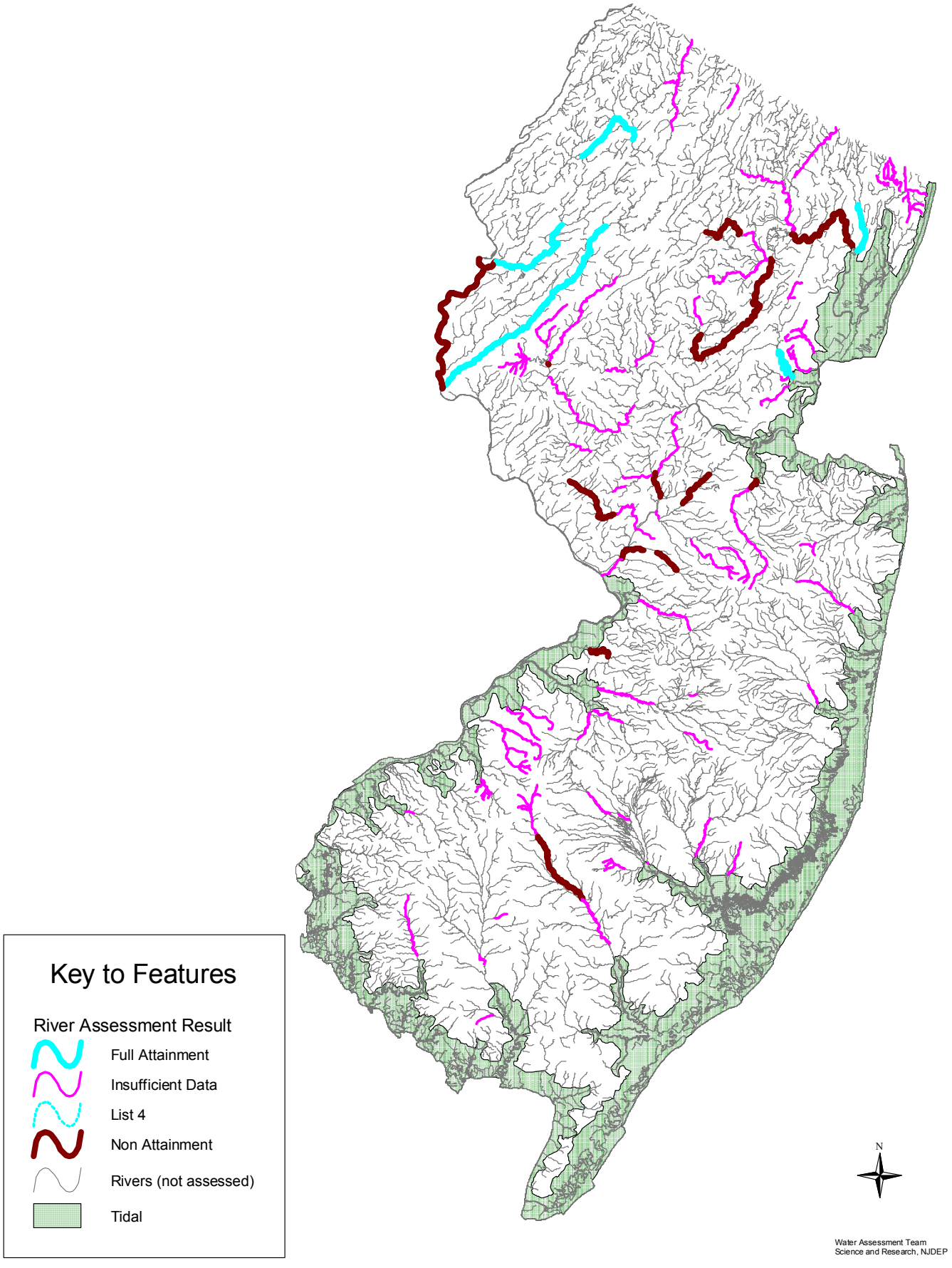


FIGURE 2.1b-5. Assessment Status for Cadmium in Rivers.



Chromium

A total of 109 sites representing 703 river miles were assessed for chromium. Only 18% of the sites were listed on sublist 5, with over 95% of the sites being carried over from the 1998 303(d) List due to insufficient data to make re-assessments. All of the listings on sublist 3 have insufficient data to make an assessment.

Results of the chromium assessment are summarized below in Table 2.1b-9. Results for individual stations are depicted in Figure 2.1b-6 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-9. Chromium Status

Chromium Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	46	42%	344	0	49%	NA
Sublist 3	44	40%	226	0	32%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	19	18%	133	0	19%	NA
Totals	109	100%	703	0	100%	NA

Of the 46 stations on the 1998 303(d) List for chromium, 59% were delisted (see Table 2.1b-10) and 18 of the 19 sites on sublist 5 carried over due to insufficient data available (see Table 2.1b-11).

Table 2.1b-10. Delisted Chromium Sites From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
02	01367700, 2-WAL-1	Wallkill River near Franklin	12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum
02	01367715, 2-WAL-2	Wallkill River at Scott Road at Franklin	13	01408500, 13-TOM-1	Toms River near Toms River
02	01367770, 2-WAL-4	Wallkill River near Sussex	14	01409416, 14-HAM-2	Hammonton Creek at Westcoatville
02	01368000, 2-WAL-5	Wallkill Run near Unionville	15	01410784, 15-GEH-1	Great Egg Harbor River near Sicklerville
06	01381200, 6-ROC-1, 6-SITE-10	Rockaway River at Pine Brook	15	01411110, 15-GEH-3	Great Egg Harbor River at Weymouth
06	01381500, 6-WHI-1	Whippany River at Morristown	01	01445500, 1-PEQ-2	Pequest River at Pequest
06	01381800, 6-WHI-2	Whippany River near Pine Brook	01	01456200, 1-MUS-3	Musconetcong River at Beattystown
03	01387500, 3-RAM-1, 3-SITE-9	Ramapo River near Mahwah	01	01457000, 1-MUS-4	Musconetcong River near Bloomsbury
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn	01	01457400, 1-MUS-5	Musconetcong River at Riegelsville
04	01391500, 4-SITE-12	Saddle River at Lodi	11	01464020, 11-AS-3	Assunpink Creek at Peace Street at Trenton
01	01400540, 10-MIL-1	Millstone River near Manalapan	18	01467150, 18-CO-4	Cooper River at Haddonfield
10	01401000, 10-STO-1, 10-STO-4	Stony Brook at Princeton	18	18-CO-1	Cooper River at Rte 130 in Camden
10	01402000, 10-MIL-5, 10-MIL-6	Millstone River at Blackwells Mills	02	2-WAL-3	Wallkill River on Ames Blvd (Rte 94) in Hamburg
10	01402540, 10-MIL-3	Millstone River at Weston			

Table 2.1b-11. Chromium Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name		WMA	Station Number	Station Name
05	01377000, 5-HAC-3	Hackensack River at Rivervale		15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom
06	01380500, 6-SITE-11	Rockaway River at Boonton		01	01446400, 1-PEQ-3	Pequest River at Belvidere
06	01382000, 6-SITE-3	Passaic River at Two Bridges		01	01447000,	Delaware River at Easton
04	01389130, 4-PAS-4	Passaic River at Sigac		10	10-ROC-1	Rocky Brook on Rte 33 in Hightstown
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls		10	10-ROC-2	Rocky Brook at Rocky Bk Rd and Rte 130 in Hightstown
04	01389880, 4-SITE-5	Passaic River at Elmwood Park		10	10-STO-3	Stony Brook on Mine Rd in Hopewell Twp.
08	01398102, 8-SB-6	SB Raritan River at South Branch		20	20-AS-1	Assiscunk Creek at Cedar Lane in Springfield
10	01400585,	Rocky Brook at Perrineville		09	9-LAW-1	Lawrence Brook at Davidsons Mill Rd in Black Horse
10	01401440, 10-MIL-2	Millstone River at Kingston		09	South River	South River

FIGURE 2.1b-6. Assessment Status of Stations Monitored for Chromium. Includes sites delisted and carried over from the 1998 303(d) List.

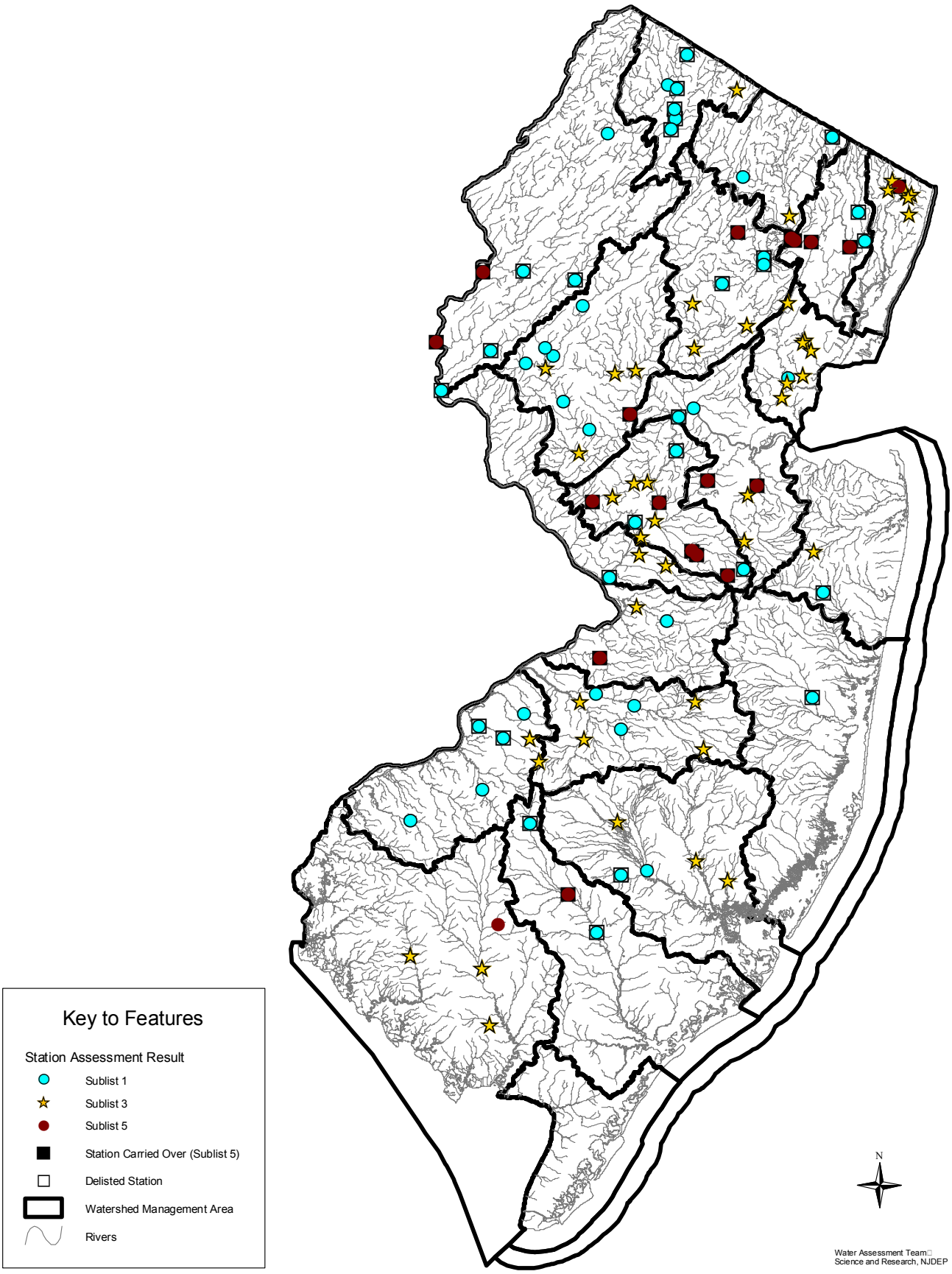
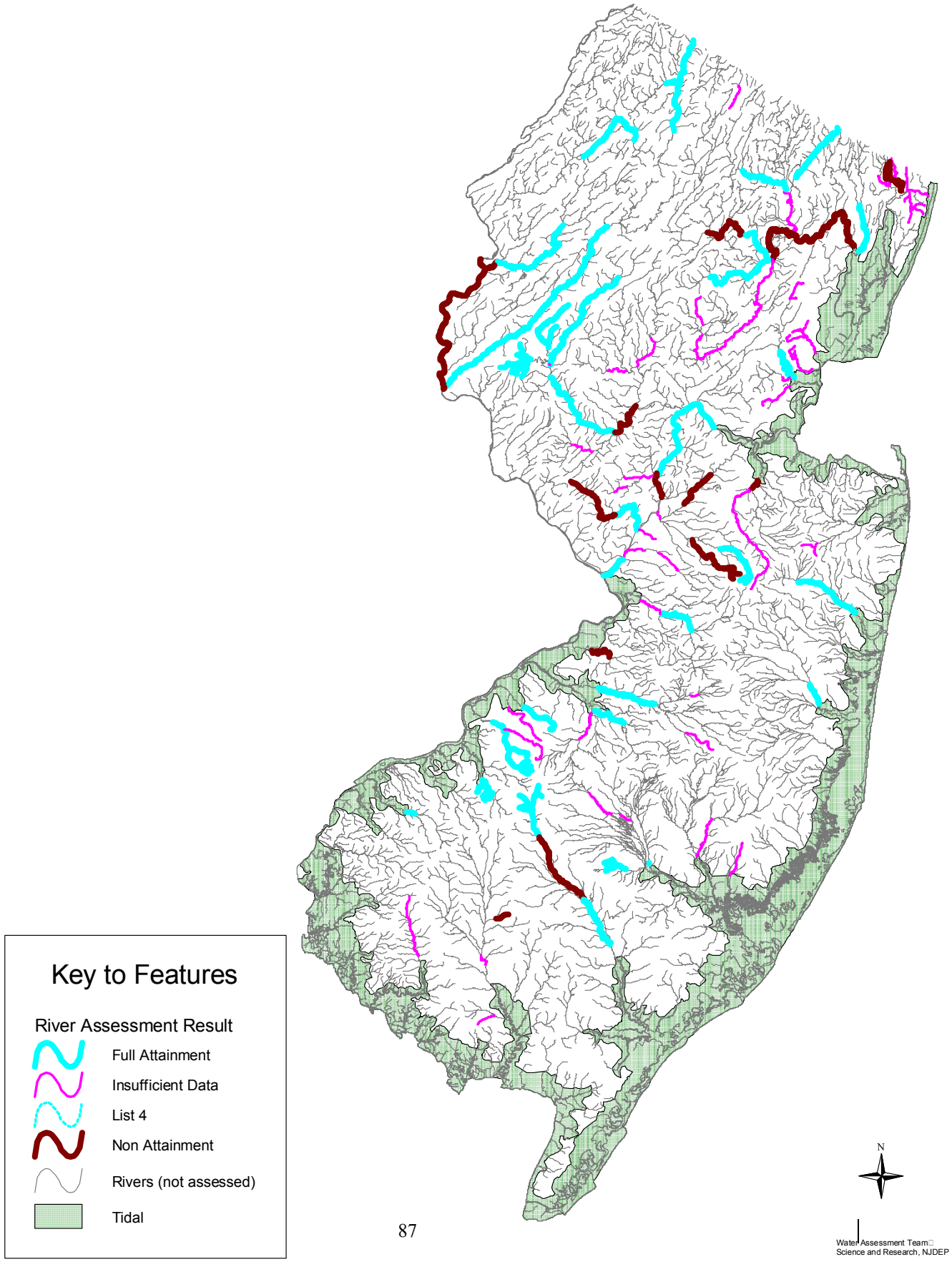


FIGURE 2.1b-7. Assessment Status for Chromium in Rivers.



Copper

A total of 109 sites representing 695 river miles were assessed for copper. Only 26% of the sites were listed on sublist 5, with 65% of the sites being carried over from the 1998 303(d) List due to insufficient data to make re-assessments. All of the listings on sublist 3 have insufficient data to make an assessment.

Results of the copper assessment are summarized below in Table 2.1b-12. Results for individual stations are depicted in Figure 2.1b-8 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-12. Copper Status

Copper Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	41	38%	317	0	46%	NA
Sublist 3	39	36%	173	0	25%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	29	26%	205	0	29%	NA
Totals	109	100%	695	0	100%	NA

Of the 41 stations on the 1998 303(d) List for copper, 41% were delisted (see Table 2.1b-13) and 19 of the 24 sites on sublist 5 were carried over due to insufficient data available (see Table 2.1b-14).

Table 2.1b-13. Delisted Copper Sites From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
06	01381500, 6-WHI-1	Whippany River at Morristown	01	01456200, 1-MUS-3	Musconetcong River at Beattystown
03	01382500, 3-PEQ-1, 3-SITE-8	Pequannock River at Macopin Intake Dam	01	01457000, 1-MUS-4	Musconetcong River near Bloomsbury
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn	01	01457400, 1-MUS-5	Musconetcong River at Riegelsville
04	01391500, 4-SITE-12	Saddle River at Lodi	19	01465850, 19-RA-3S	SB Rancocas Creek at Vincentown
08	01396588, 8-SP-2	Spruce Run near Glen Gardner	18	01467150, 18-CO-4	Cooper River at Haddonfield
12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum	18	01467329, 18-BIG-1	SB Big Timber Creek at Blackwood Terrace
13	01408500, 13-TOM-1	Toms River near Toms River	18	01477120, 18-RAC-1	Raccoon Creek near Swedesboro
14	01409416, 14-HAM-2	Hammonton Creek at Westcoatville	18	18-CO-1	Cooper River at Rte 130 in Camden
15	01410784, 15-GEH-1	Great Egg Harbor R nr Sicklerville			

Table 2.1b-14. Copper Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
05	01377000, 5-HAC-3	Hackensack River at Rivervale	14	01409387, 14-MUL-2	Mullica River at Outlet Of Atsion Lake at Atsion
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington	14	01410150, 14-EBR-1	East Branch Bass River near New Gretna
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham	15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom
06	01382000, 6-SITE-3	Passaic River at Two Bridges	01	01447000,	Delaware RIver at Easton
04	01389130, 4-PAS-4	Passaic River at Sigac	11	01463620, 11-AS-2	Assunpink Creek near Clarksville
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls	11	11-AS-4	Assunpink Creek at Route 535
04	01389880, 4-SITE-5	Passaic River at Elmwood Park	09	9-LAW-1	Lawrence Brook at Davidsons Mill Rd in Black Horse
08	01398000, 8-NE-1	Neshanic River at Reaville	18	Newton Creek	Newton Creek
08	01398102, 8-SB-6	SB Raritan River at South Branch	09	South River	South River
08	01399120, 8-NB-2	NB Raritan River at Burnt Mills			

FIGURE 2.1b-8. Assessment Status of Sites Monitored for Copper. Includes sites delisted and carried over from the 1998 303(d) List.

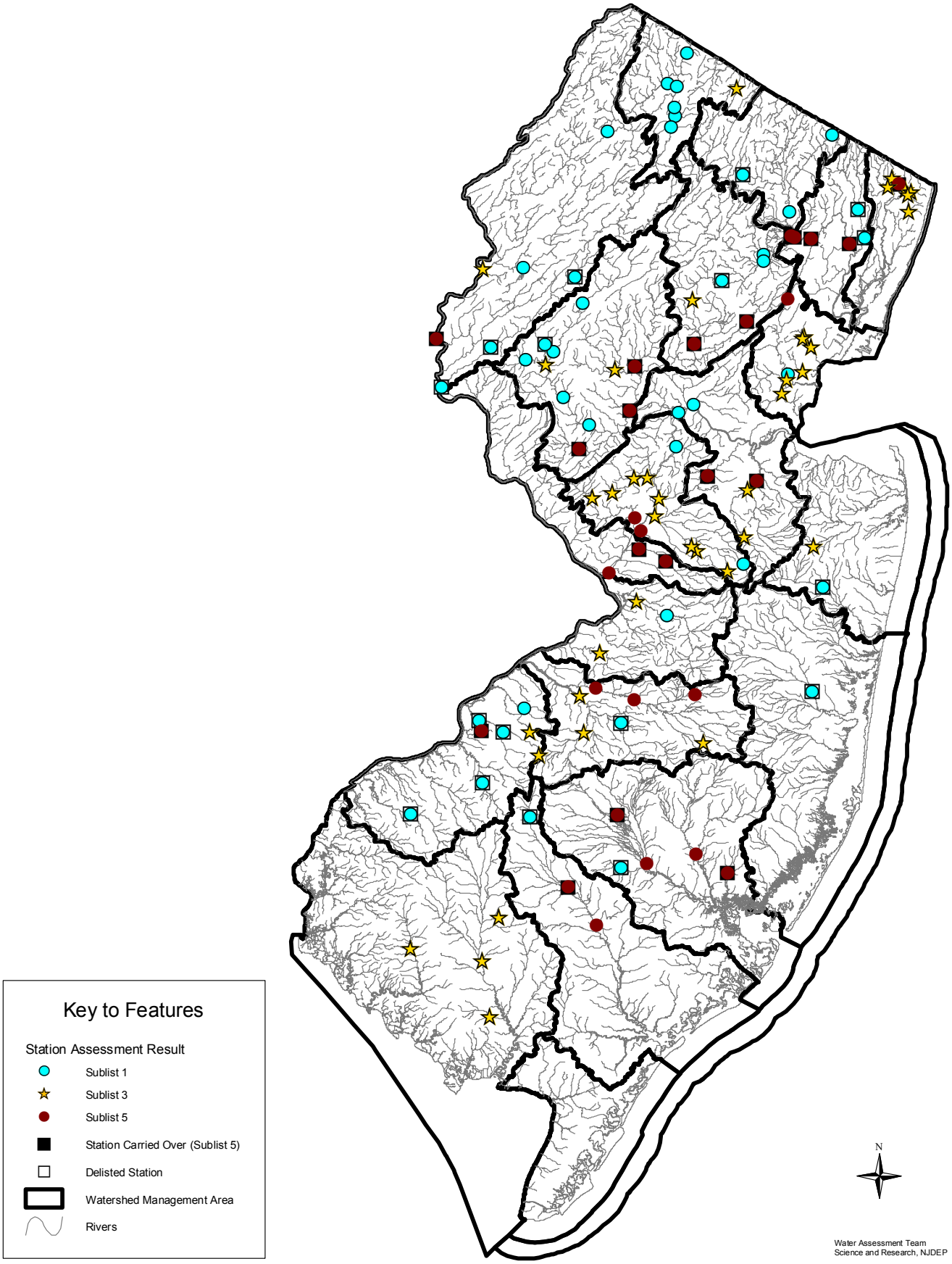
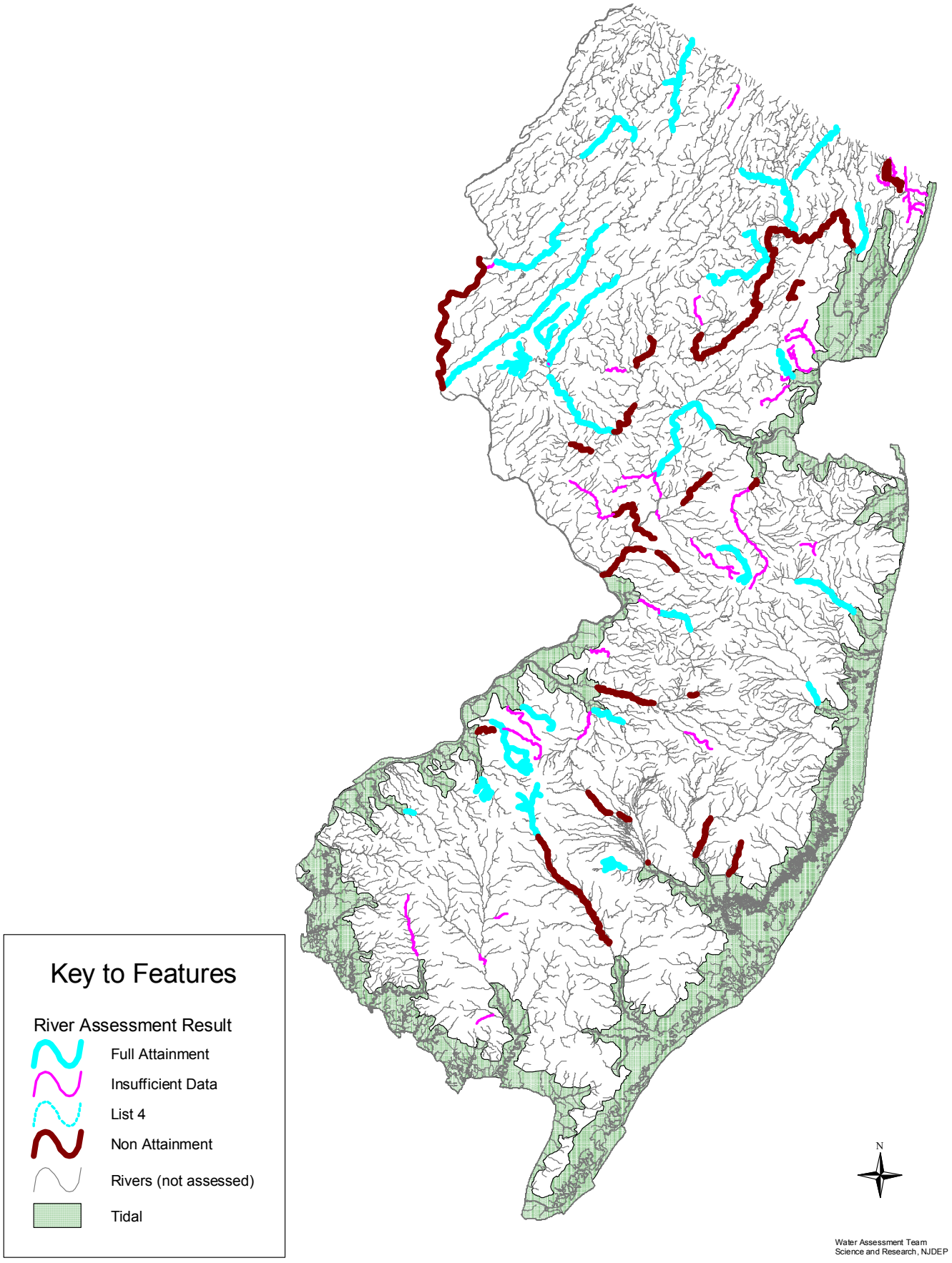


FIGURE 2.1b-9. Assessment Status for Copper in Rivers.



Mercury

A total of 108 sites representing 696 river miles were assessed for mercury. Because the chronic aquatic life criteria is below the method detection level (MDL), no sites were placed on sublist 1 as "Full Attainment." (see the Methods Document, Section 4.2.2 for an explanation of MDLs for metals) If the data showed no exceedances, it was listed under sublist 3 as "Insufficient Data." Of the 83 sites on sublist 3, over half of the sites (53% of sublist 3 sites) had no exceedances, but were assessed as "Insufficient Data." Only 25% of the total sites were assessed as "non attainment", of which 44% were carried over from the 1998 303(d) List due to insufficient data available for new assessments.

Results of the mercury assessment are summarized below in Table 2.1b-15. Results for individual stations are depicted in Figure 2.1b-10 and in Tables II-15 through 18 in the Appendix.

Table 2.1-15. Mercury Status

Mercury Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	0	NA	0	0	NA	NA
Sublist 3	83	75%	509	0	72%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	27	25%	197	0	28%	NA
Totals	110	100%	706	0	100%	NA

Of the 44 stations on the 1998 303(d) List for mercury, 45% were delisted (see Table 2.1b-16) and 21of the 24 sites on sublist 5 were carried over due to insufficient data available (see Table 2.1b-17).

Table 2.1b-16. Delisted Mercury Sites From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
02	01367700, 2-WAL-1	Wallkill River near Franklin	13	01408500, 13-TOM-1	Toms River near Toms River
02	01367715, 2-WAL-2	Wallkill River at Scott Road at Franklin	15	01411110, 15-GEH-3	Great Egg Harbor River at Weymouth
02	01367770, 2-WAL-4	Wallkill River near Sussex	01	01445500, 1-PEQ-2	Pequest River at Pequest
02	01368000, 2-WAL-5	Wallkill Run near Unionville	11	01467150, 18-CO-4	Assunpink Creek at Peace Street at Trenton
06	01381200, 6-ROC-1, 6-SITE-10	Rockaway River at Pine Brook	01	01456200, 1-MUS-3	Musconetcong River at Beattystown
06	01381500, 6-WHI-1	Whippany River at Morristown	01	01457000, 1-MUS-4	Musconetcong River near Bloomsbury
03	01387500, 3-RAM-1, 3-SITE-9	Ramapo River near Mahwah	01	01457400, 1-MUS-5	Musconetcong River at Riegelsville
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn	19	01467000, 19-RA-3N	NB Rancocas Creek at Pemberton
04	01391500, 4-SITE-12	Saddle River at Lodi	19	01467006, 19-RA-4N	NB Rancocas Creek at Pine St at Mt Holly
10	01400540, 10-MIL-1	Millstone River near Manalapan	18	01467150, 18-CO-4	Cooper River at Haddonfield

Table 2.1b-16. Delisted Mercury Sites From 1998 303(d) List (cont.)

WMA	Station Number	Station Name	WMA	Station Number	Station Name
10	01402000, 10-MIL-5, 10-MIL-6	Millstone River at Blackwells Mills	18	01477120, 18-RAC-1	Raccoon Creek near Swedesboro
10	01402540, 10-MIL-3	Millstone River at Weston	18	18-CO-1	Cooper River at Rte 130 in Camden
12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum	02	2-WAL-3	Wallkill River on Ames Blvd (Rte 94) in Hamburg

Table 2.1b-17. Mercury Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name		WMA	Station Number	Station Name
05	01377000, 5-HAC-3	Hackensack River at Rivervale		15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington		01	01446400, 1-PEQ-3	Pequest River at Belvidere
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham		01	01447000	Delaware River at Easton
06	01380500, 6-SITE-11	Rockaway River at Boonton		11	01463620, 11-AS-2	Assunpink Creek near Clarksville
04	01382000, 6-SITE-3	Passaic River at Two Bridges		19	01465950, 19-RA-1N	NB Rancocas Creek at Hanover Furnace
04	01389130, 4-PAS-4	Passaic River at Sigac		19	01465970	NB Rancocas Creek at Browns Mills
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls		10	10-STO-3	Stony Brook on Mine Rd in Hopewell Twp.
04	01389880, 4-SITE-5	Passaic River at Elmwood Park		11	11-AS-4	Assunpink Creek @ Route 535
08	01399700, 8-RO-1	Rockaway Creek at Whitehouse		20	20-AS-1	Assiscunk Creek at Cedar Lane in Springfield
10	01401440, 10-MIL-2	Millstone River at Kingston		09	9-LAW-1	Lawrence Brook at Davidsons Mill Rd in Black Horse
15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom		09	South River	South River

FIGURE 2.1b-10. Assessment Status of Sites Monitored for Mercury. Includes sites delisted and carried over from the 1998 303(d) List.

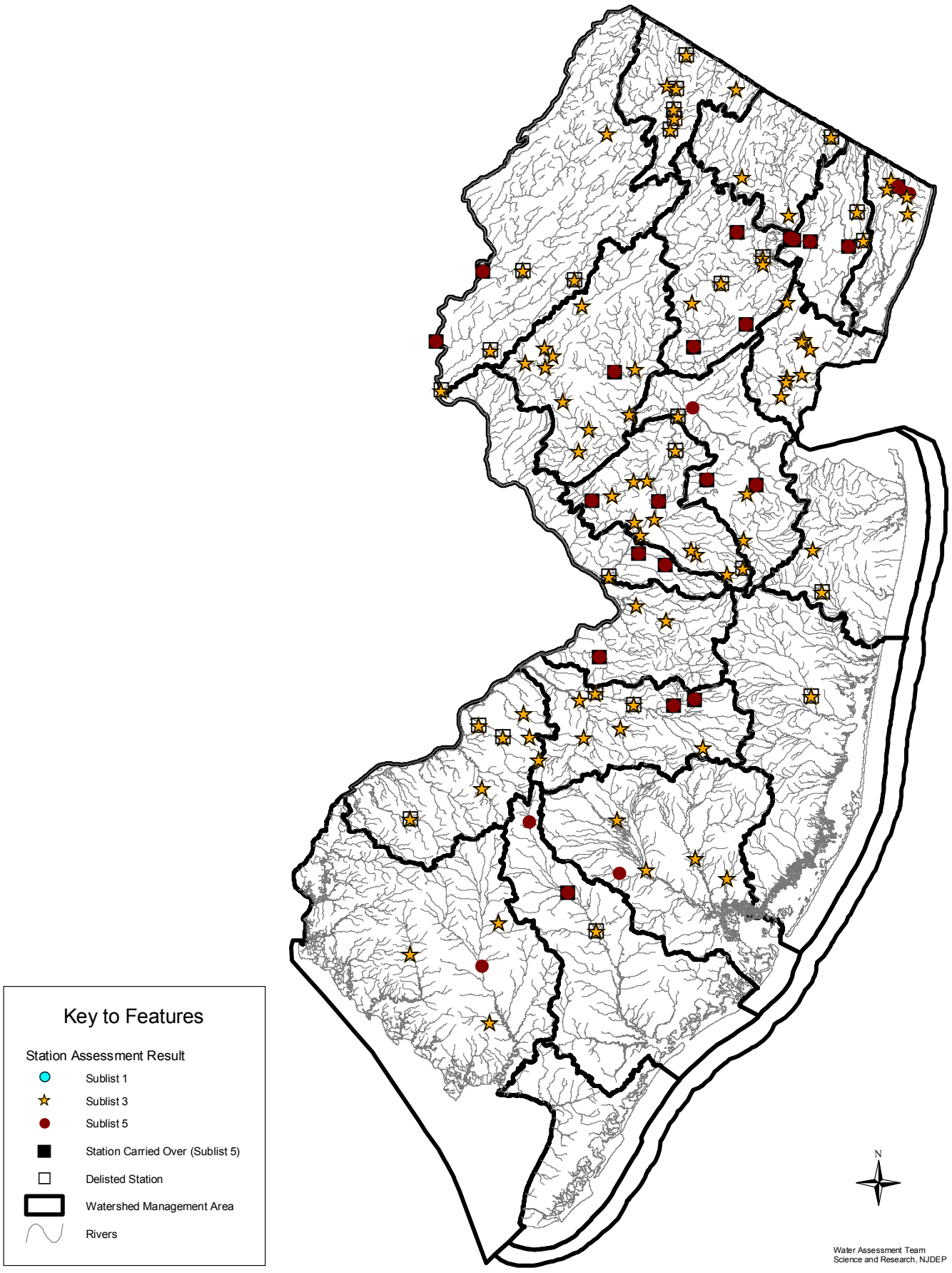
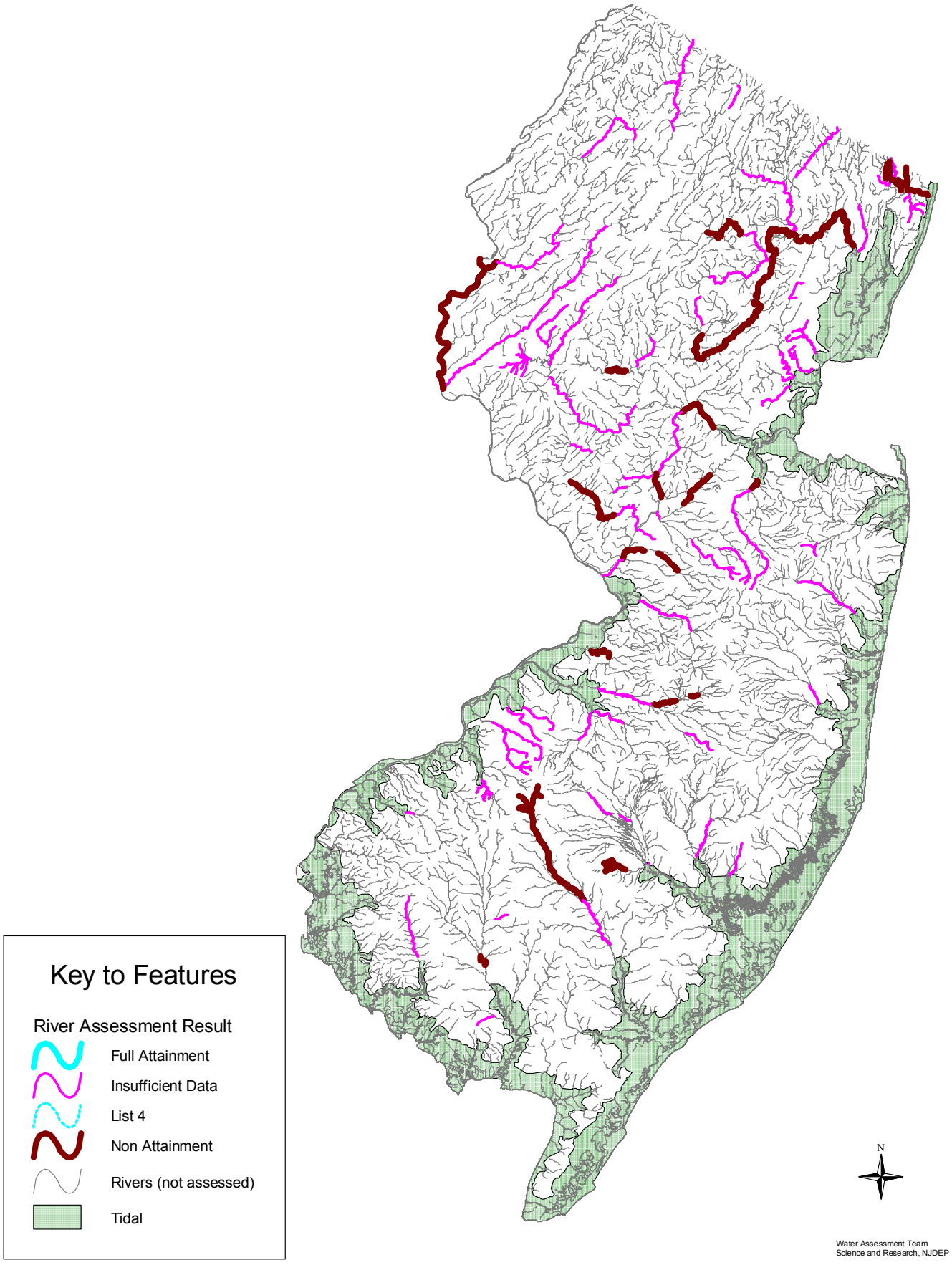


FIGURE 2.1b-9. Assessment Status for Mercury in Rivers.



Lead

A total of 109 sites representing 702 river miles were assessed for lead. Almost half of the sites (44% of total sites) were listed on sublist 5, with 63% of the sites being carried over from the 1998 303(d) List due to insufficient data to make re-assessments. The sites listed on sublist 4 are all located on the Rancocas Creek and currently have a lead reduction plan in progress. All of the listings on sublist 3 have insufficient data to make an assessment.

Results of the lead assessment are summarized below in Table 2.1b-18. Results for individual stations are depicted in Figure 2.1b-12 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-18. Lead Status

Lead Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	28	26%	212	0	30%	NA
Sublist 3	28	26%	112	0	16%	NA
Sublist 4	5	4%	26	0	4%	NA
Sublist 5	48	44%	352	0	50%	NA
Totals	109	100%	702	0	100%	NA

Of the 68 stations on the 1998 303(d) List for lead, only 34% were delisted (see Table 2.1b-19) and 30 of the 45 sites on sublist 5 were carried over due to insufficient data available (see Table 2.1b-20).

Table 2.1b-19. Delisted Lead Sites From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
02	01367700, 2-WAL-1	Wallkill River near Franklin	10	01402000, 10-MIL-5, 10-MIL-6	Millstone River at Blackwells Mills
02	01367715, 2-WAL-2	Wallkill River at Scott Road at Franklin	10	01402540, 10-MIL-3	Millstone River at Weston
02	01367770, 2-WAL-4	Wallkill River near Sussex	12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum
02	01368000, 2-WAL-5	Wallkill Run near Unionville	01	01445500, 1-PEQ-2	Pequest River at Pequest
06	01381500, 6-WHI-1	Whippany River at Morristown	01	01456200, 1-MUS-3	Musconetcong River at Beattystown
03	01387500, 3-RAM-1, 3-SITE-9	Ramapo River near Mahwah	01	01457000, 1-MUS-4	Musconetcong River near Bloomsbury
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn	01	01457400, 1-MUS-5	Musconetcong River at Riegelsville
04	01391500, 4-SITE-12	Saddle River at Lodi	20	01464500, 20-CRO-1	Crosswicks Creek at Extonville
08	01396280, 8-SB-1	SB Raritan River at Middle Valley	19	01477120, 18-RAC-1	Raccoon Creek near Swedesboro
08	01396535, 8-SB-2	SB Raritan River at Arch St at High Bridge	02	2-WAL-3	Wallkill River on Ames Blvd (Rte 94) in Hamburg
08	01396588, 8-SP-2	Spruce Run near Glen Gardner	14	01409500, 14-BAT-1	Batsto River at Batsto
08	01397000, 8-SB-3	SB Raritan River at Stanton Station			

Table 2.1b-20. Lead Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name	WMA	Station Number	Station Name
09	9-LAW-1	Lawrence Bk at Davidsons Mill Rd in Black Horse	09	01405440, 9-MAN-2	Manalapan Brook near Spotswood
05	01377000, 5-HAC-3	Hackensack River at Rivervale	14	01409387, 14-MUL-2	Mullica River at Outlet Of Atsion Lake at Atsion
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington	14	01410150, 14-EBR-1	East Branch Bass River near New Gretna
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham	15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom
06	01380500, 6-SITE-11	Rockaway River at Boonton	17	01411800, 17-MAU-1	Maurice River near Millville
06	01382000, 6-SITE-3	Passaic River at Two Bridges	17	01412800, 17-COH-1	Cohansey River at Seeley
04	01389130, 4-PAS-4	Passaic River at Sigac	01	01446400, 1-PEQ-3	Pequest River at Belvidere
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls	01	01447000,	Delaware River at Easton
04	01389880, 4-SITE-5	Passaic River at Elmwood Park	11	01463620, 11-AS-2	Assunpink Creek near Clarksville
08	01398102, 8-SB-6	SB Raritan River at South Branch	10	10-ROC-1	Rocky Brook on Rte 33 in Hightstown
08	01399700, 8-RO-1	Rockaway Creek at Whitehouse	10	10-ROC-2	Rocky Brook, Rocky Bk Rd and Rte 130 in Hightstown
10	01400585,	Rocky Brook at Perrineville	10	10-STO-3	Stony Brook on Mine Rd in Hopewell Twp.
10	01401440, 10-MIL-2	Millstone River at Kingston	11	11-AS-4	Assunpink Creek at Route 535
10	01401600, 10-BED-2, 10-BED-3	Bedens Brook near Rocky Hill	20	20-AS-1	Assiscunk Creek at Cedar Lane in Springfield
09	01405340, 9-MAN-1	Manalapan Brook at Federal Rd near Manalapan	09	South River	South River

FIGURE 2.1b-12. Assessment Status of Sites Monitored for Lead. Includes sites delisted and carried over from the 1998 303(d) List.

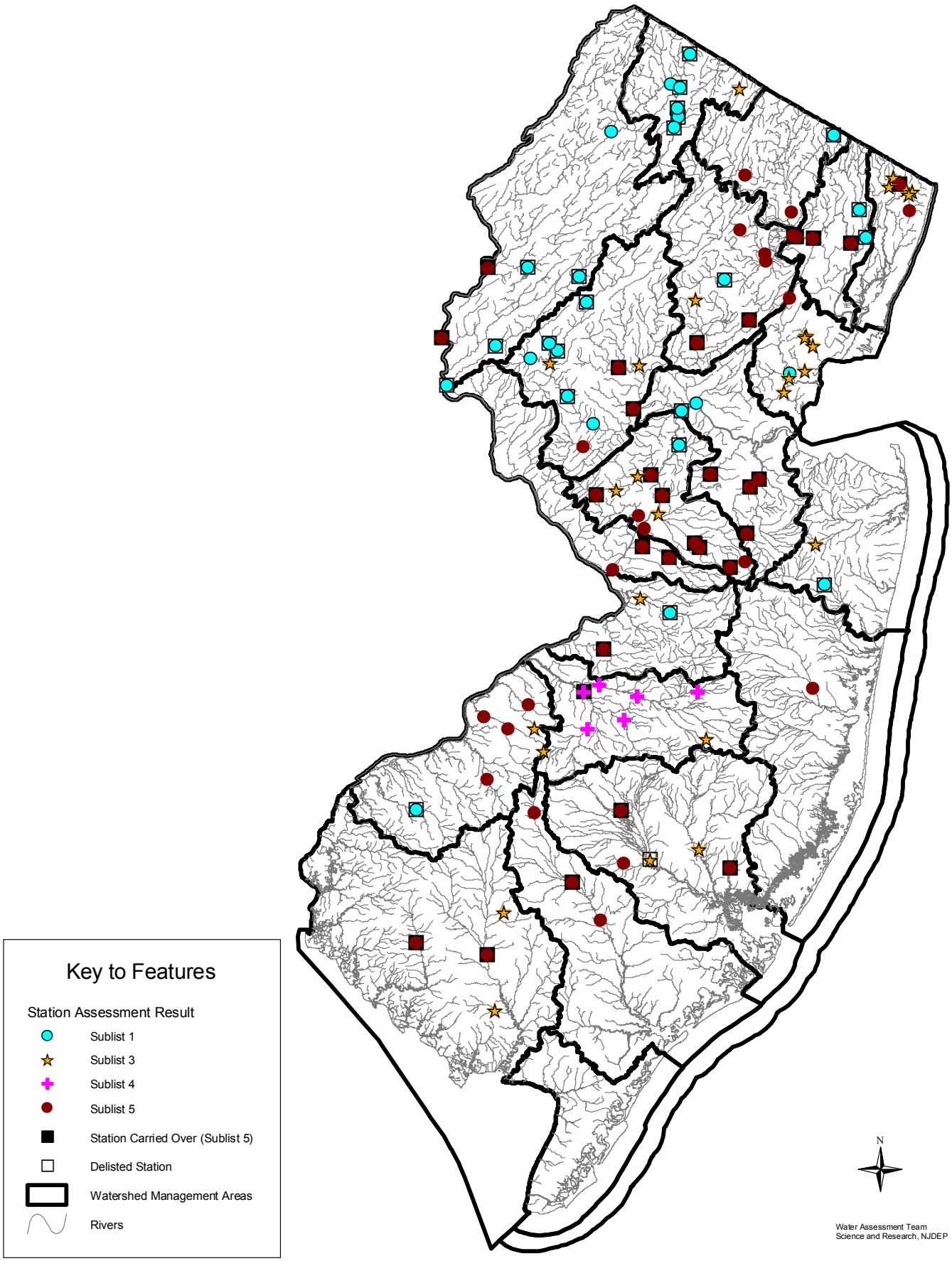
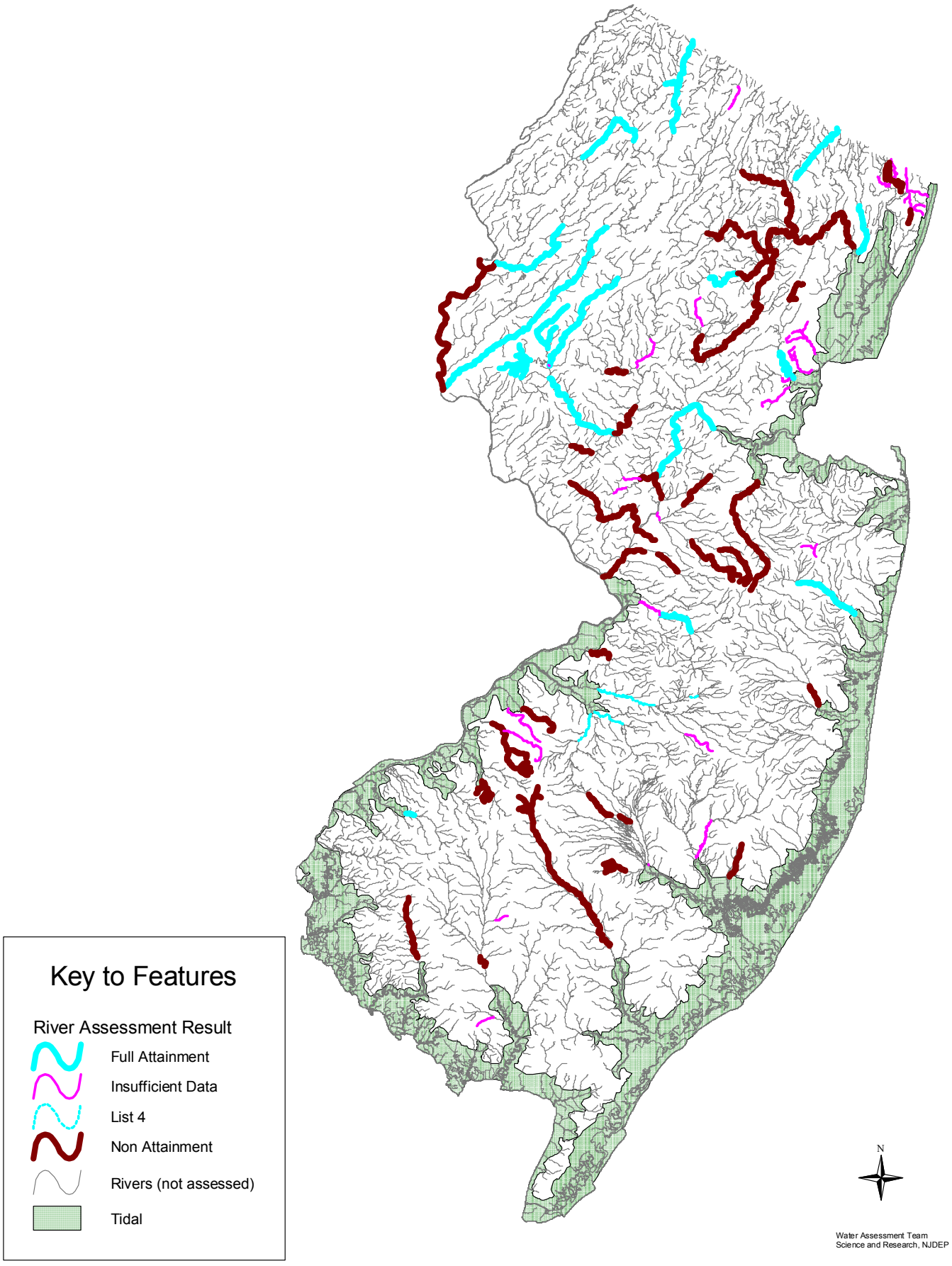


FIGURE 2.1b-13. Assessment Status for Lead in Rivers.



Nickel

A total of 106 sites representing 673 river miles were assessed for nickel. Only one site, carried over from the 1998 303(d) list, located on the Hackensack River exceeded the standards for nickel. However, a TMDL was implemented for the river, therefore the site was placed on sublist 4. All of the listings on sublist 3 have insufficient data to make an assessment.

Table 2.1b-21. Nickel Status

Nickel Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	44	42%	330	0	49%	NA
Sublist 3	61	58%	333	0	50%	NA
Sublist 4	1	<1%	10	0	1%	NA
Sublist 5	0	NA	0	0	NA	NA
Totals	106	100%	673	0	100%	NA

Only 4 stations were placed on the 1998 303(d) List for lead, with 75% delisted (see Table 2.1b-22). The only station not delisted was Hackensack River on Westwood Avenue in Riverside..

Results of the nickel assessment are summarized below in Table 2.1b-122. Results for individual stations are depicted in Figure 2.1b-14 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-22. Delisted Nickel Sites From 1998 303(d) List

WMA	Station Number	Station Name
12	01408000, 12-MA-1, 12-MA-2, 12-MA-3	Manasquan River at Squankum
15	01411110, 15-GEH-3	Great Egg Harbor River at Weymouth
18	01477120, 18-RAC-1	Raccoon Creek near Swedesboro

FIGURE 2.1b-14. Assessment Status of Sites Monitored for Nickel. Includes sites delisted and carried over from the 1998 303(d) List.

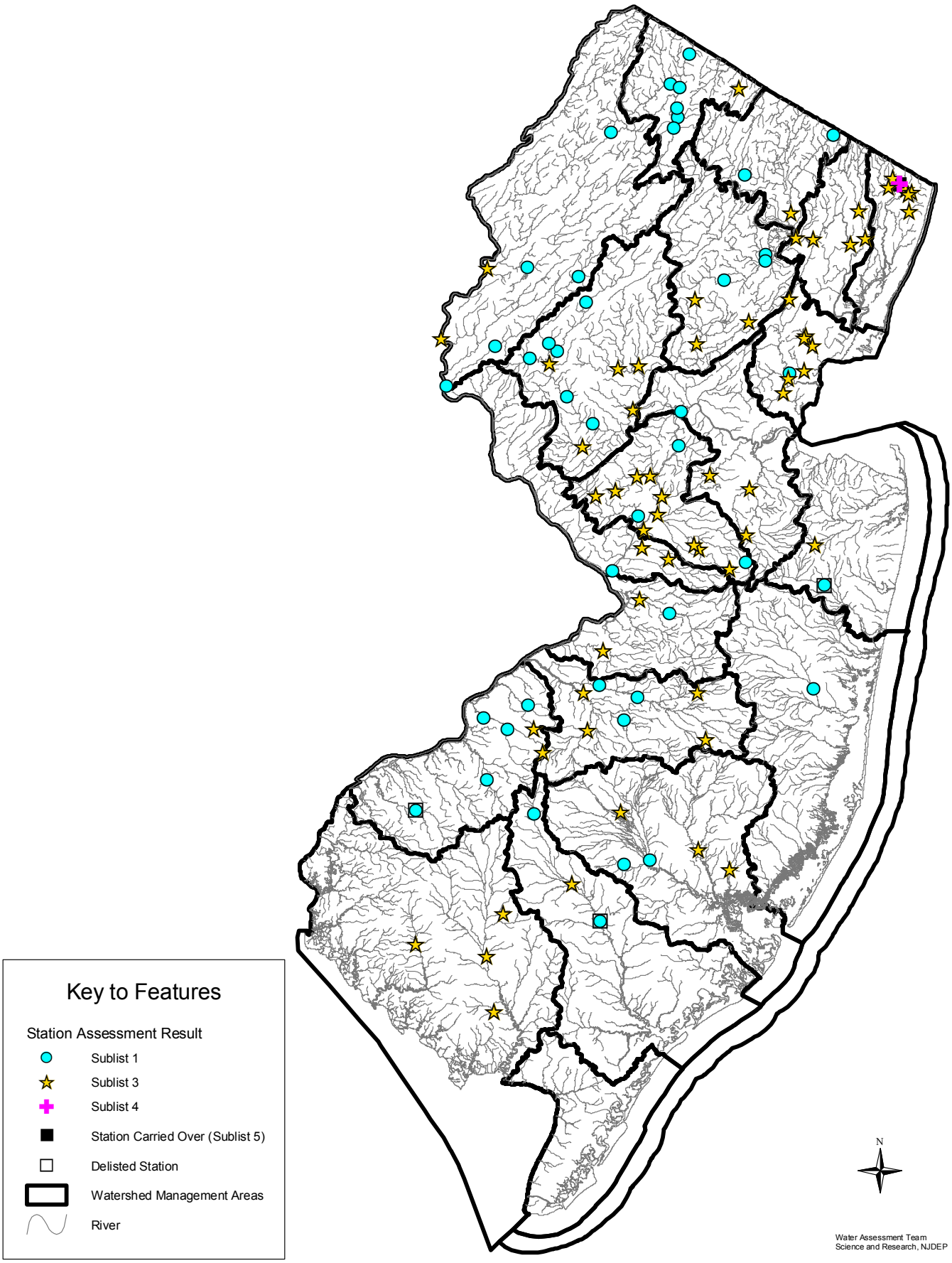
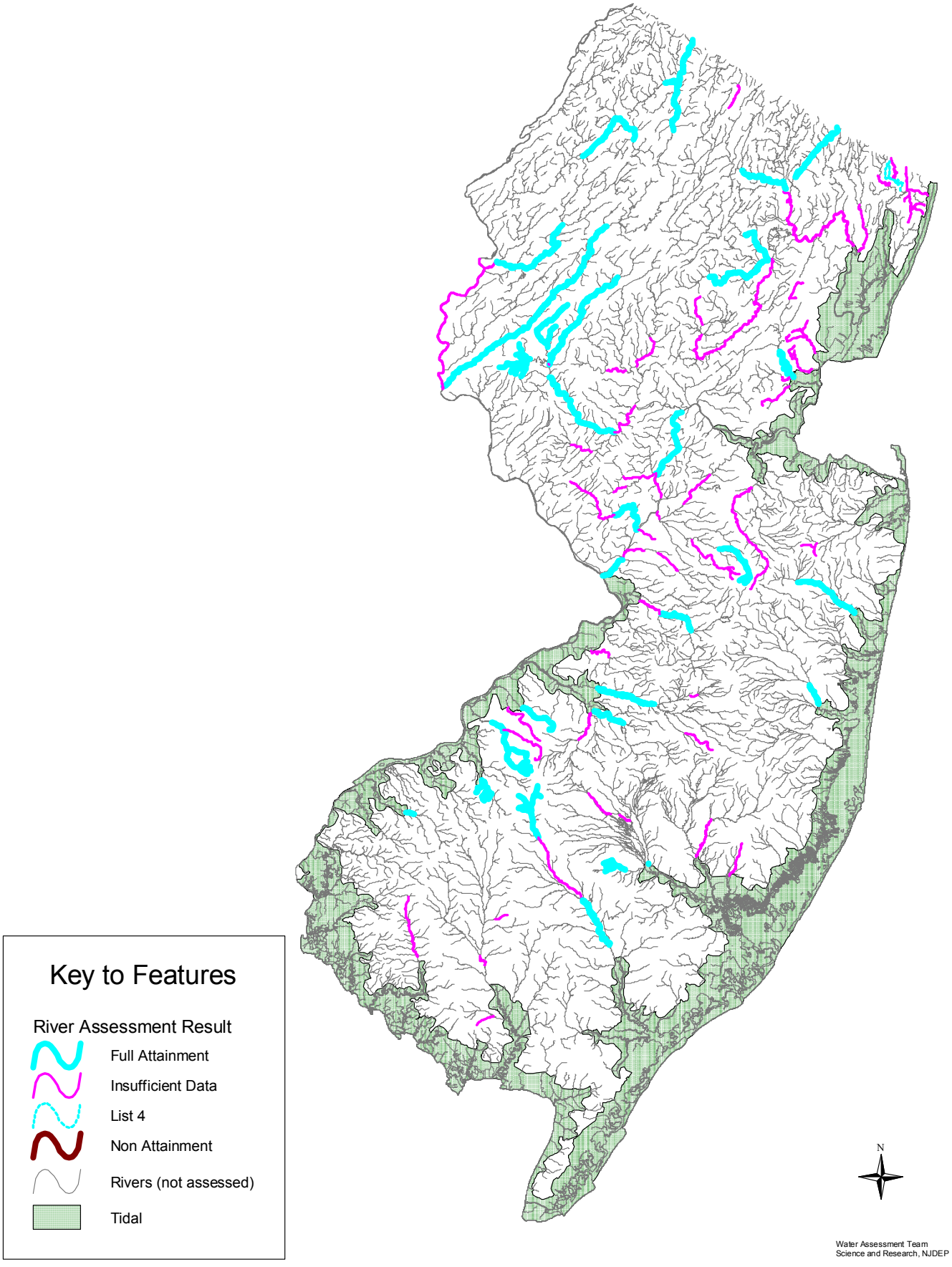


FIGURE 2.1b-15. Assessment Status for Nickel in Rivers.



Zinc

A total of 106 sites representing 683 river miles were assessed for zinc. Only 20% of the sites were listed on sublist 5, with 80% of the sites being carried over from the 1998 303(d) List due to insufficient data to make re-assessments. All of the listings on sublist 3 have insufficient data to make an assessment.

Results of the zinc assessment are summarized below in Table 2.1b-23. Results for individual stations are depicted in Figure 2.1b-16 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-23. Zinc Status

Zinc Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	44	41%	333	0	49%	NA
Sublist 3	41	39%	215	0	31%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	21	20%	135	0	20%	NA
Totals	106	100%	683	0	100%	NA

Of the 31 stations on the 1998 303(d) List for zinc, almost half of the sites (44% of the listed sites) were delisted (see Table 2.1b-24) and all of the sites on sublist 5 were carried over due to insufficient data available (see Table 2.1b-25).

Table 2.1b-24. Delisted Zinc Sites From 1998 303(d) List

WMA	Station Number	Station Name		WMA	Station Number	Station Name
06	01381200, 6-ROC-1, 6-SITE-10	Rockaway River at Pine Brook		14	01409416, 14-HAM-2	Hammonton Creek at Westcoatville
06	01381500, 6-WHI-1	Whippany River at Morristown		14	01409500, 14-BAT-1	Batsto River at Batsto
04	01391200, 4-SAD-1, 4-SITE-13	Saddle River at Fair Lawn		15	01410784, 15-GEH-1	Great Egg Harbor River near Sicklerville
04	01391500, 4-SITE-12	Saddle River at Lodi		15	01411110, 15-GEH-3	Great Egg Harbor River at Weymouth
08	01397400, 8-SB-4	SB Raritan River at Three Bridges		19	01467000, 19-RA-3N	NB Rancocas Creek at Pemberton
10	01400540, 10-MIL-1	Millstone River near Manalapan		18	01467150, 18-CO-4	Cooper River at Haddonfield
13	01408500, 13-TOM-1	Toms River near Toms River		18	18-CO-1	Cooper River at Rte 130 in Camden

Table 2.1b-25. Zinc Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name		WMA	Station Number	Station Name
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington		14	01409387, 14-MUL-2	Mullica River at Outlet Of Atsion Lake at Atsion
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham		14	01410150, 14-EBR-1	East Branch Bass River near New Gretna
06	01380500, 6-SITE-11	Rockaway River at Boonton		15	01411000, 15-GEH-2	Great Egg Harbor River at Folsom
04	01389130, 4-PAS-4	Passaic River at Sigac		10	10-ROC-1	Rocky Brook on Rte 33 in Hightstown
04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls		10	10-ROC-2	Rocky Brook, Rocky Bk Rd and Rte 130 in Hightstown
04	01389880, 4-SITE-5	Passaic River at Elmwook Park		10	10-STO-3	Stony Brook on Mine Rd in Hopewell Twp.
10	01400585,	Rocky Brook at Perrineville		09	9-LAW-1	Lawrence Brook at Davidsons Mill Rd in Black Horse
10	01401440, 10-MIL-2	Millstone River at Kingston		18	Newton Creek	Newton Creek
09	01405440, 9-MAN-2	Manalapan Brook near Spotswood				

FIGURE 2.1b-16. Assessment Status of Sites Monitored for Zinc.
Includes sites delisted and carried over from the 1998 303(d) List

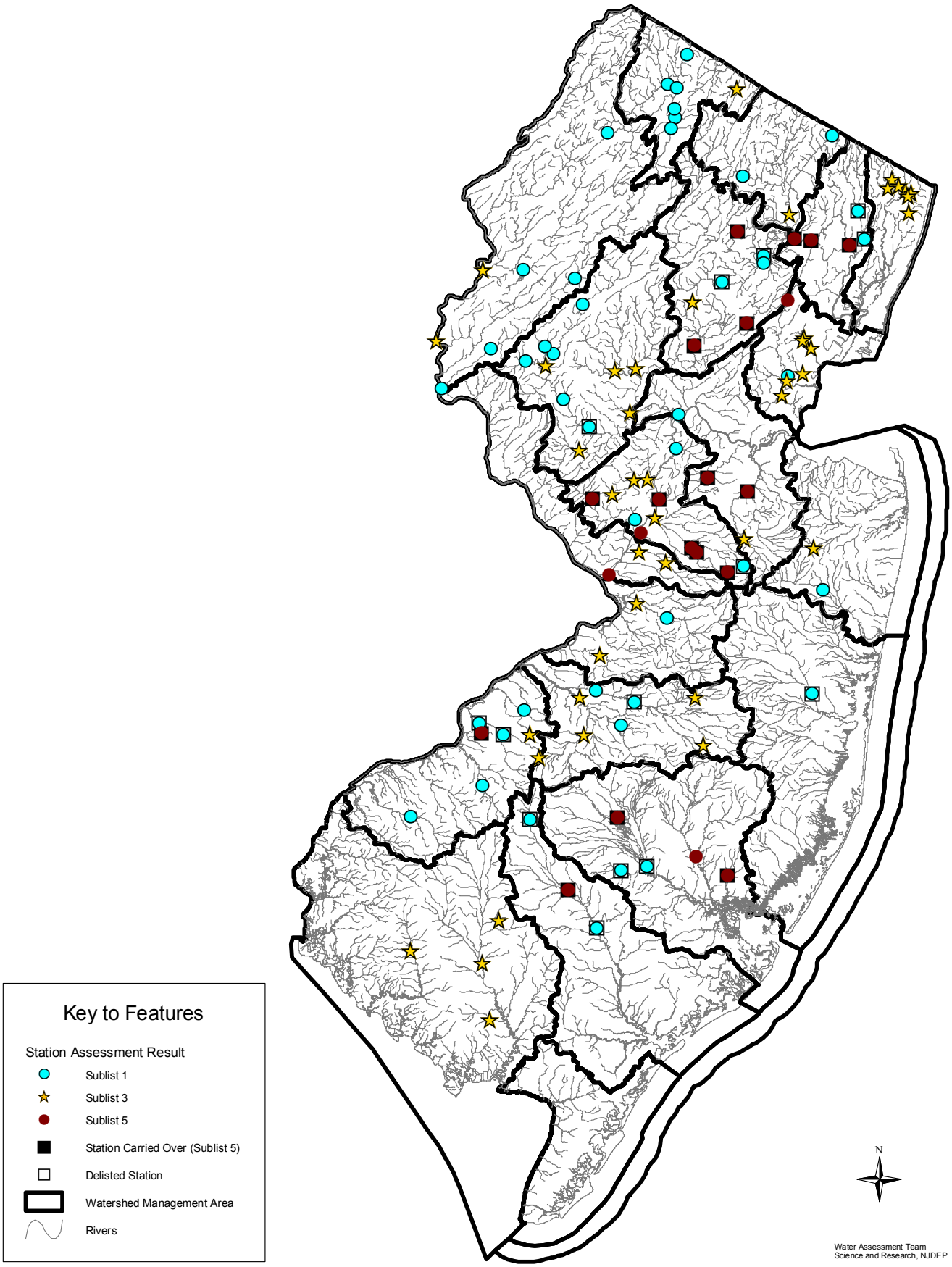
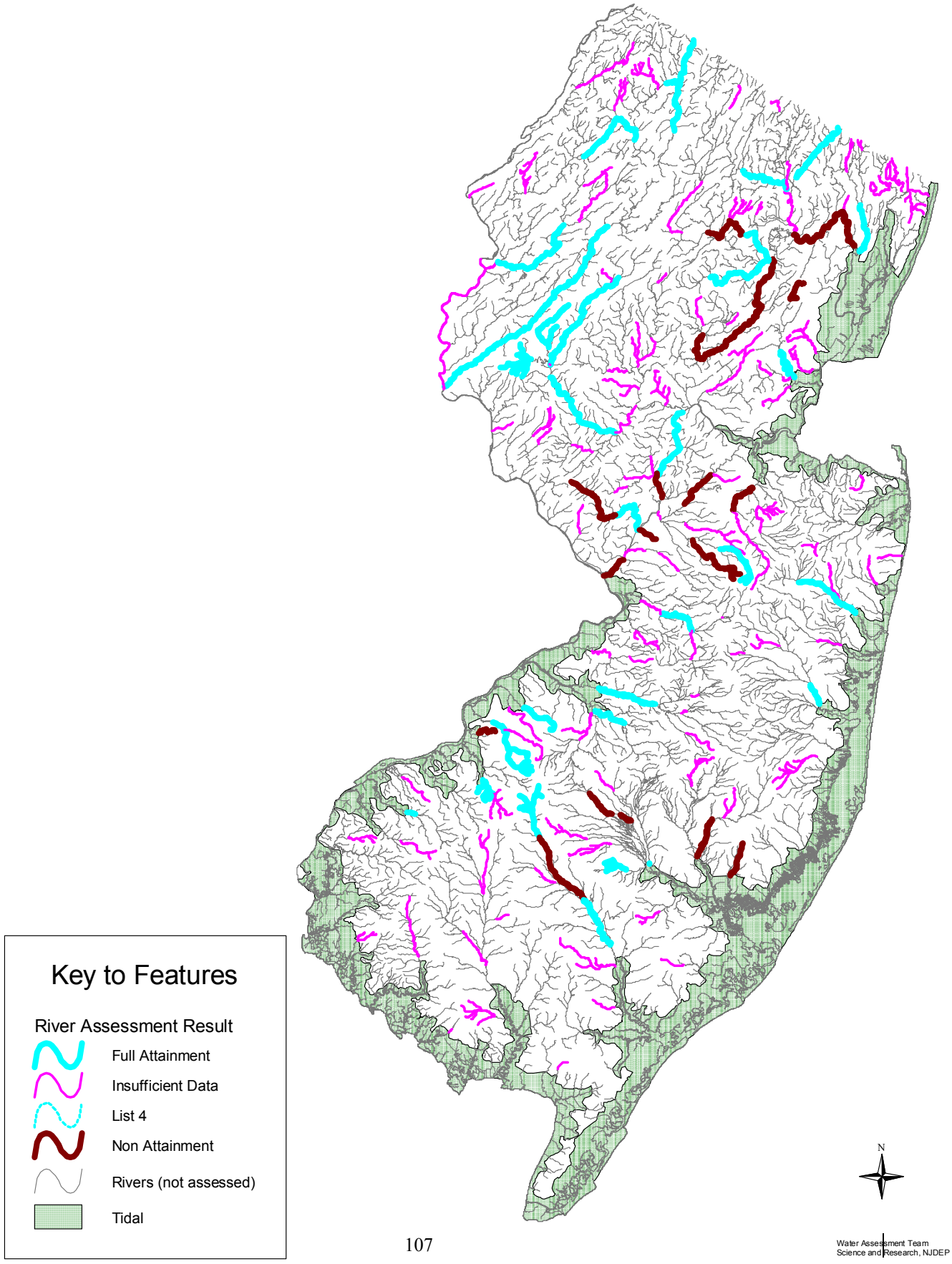


FIGURE 2.1b-17. Assessment Status for Zinc in Rivers.


Key to Features
River Assessment Result
Full Attainment
Insufficient Data
List 4
Non Attainment
Rivers (not assessed)
Tidal
N
Water Assessment Team
Science and Research, NJDEP

Selenium

A total of 107 sites representing 697 river miles were assessed for selenium. Only 1 site was listed on sublist 5, which was carried over from the 1998 303(d) List due to insufficient data to make re-assessments. All of the listings on sublist 3 have insufficient data to make an assessment.

Results of the selenium assessment are summarized below in Table 2.1b-26. Results for individual stations are depicted in Figure 2.1b-18 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-26. Selenium Status

Selenium Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	44	41%	330	0	48%	NA
Sublist 3	62	58%	344	0	50%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	1	1%	9	0	2%	NA
Totals	107	100%	683	0	100%	NA

Only 2 sites were listed on the 1998 303(d) List for selenium with 1 site, Rockaway River at Boonton, being delisted, and the other, Rockaway River at Pine Brook, carried over to sublist 5 due to insufficient data available.

FIGURE 2.1b-18. Assessment Status of Sites Monitored for Selenium. Includes sites delisted and carried over from the 1998 303(d) List.

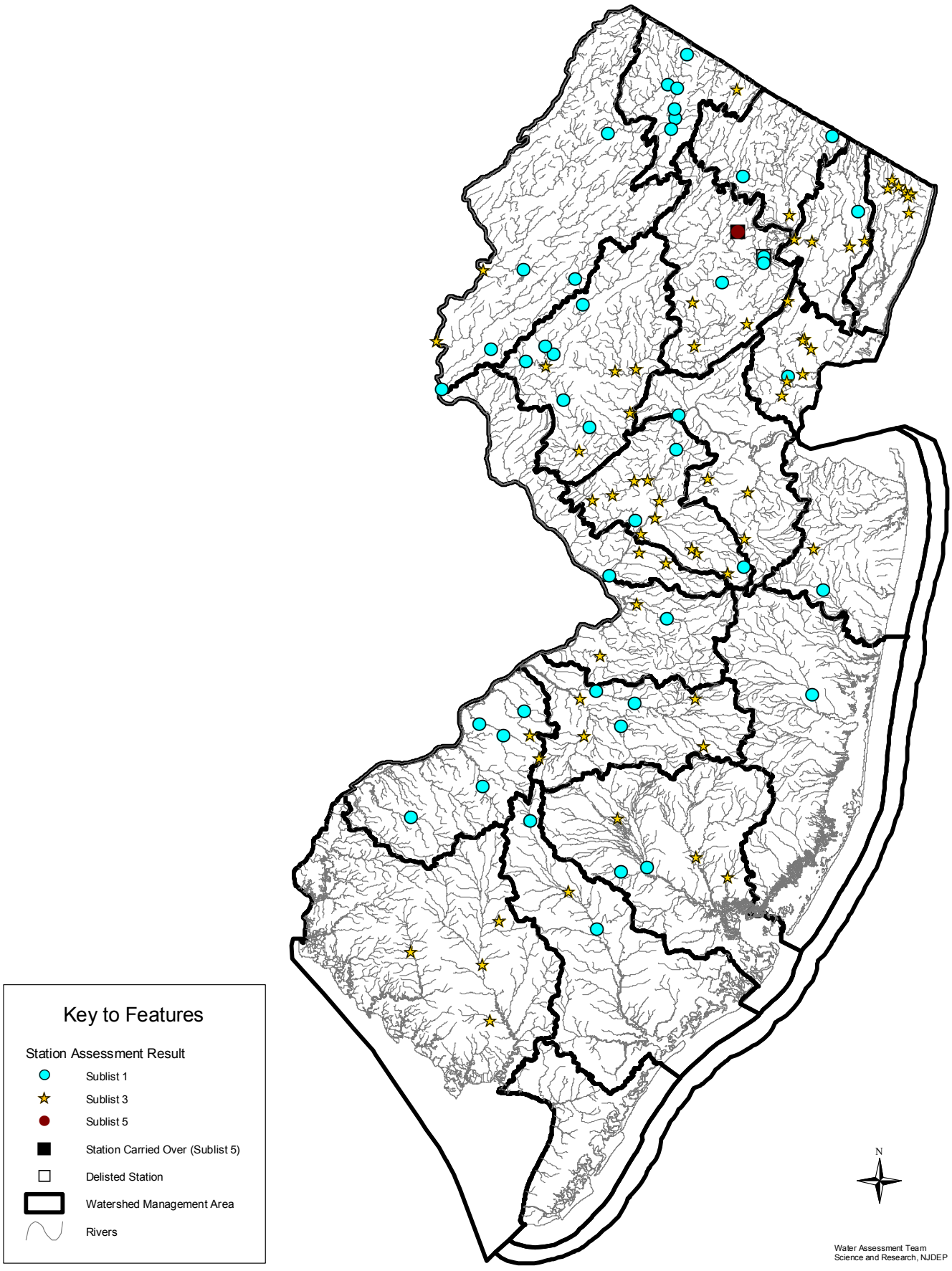
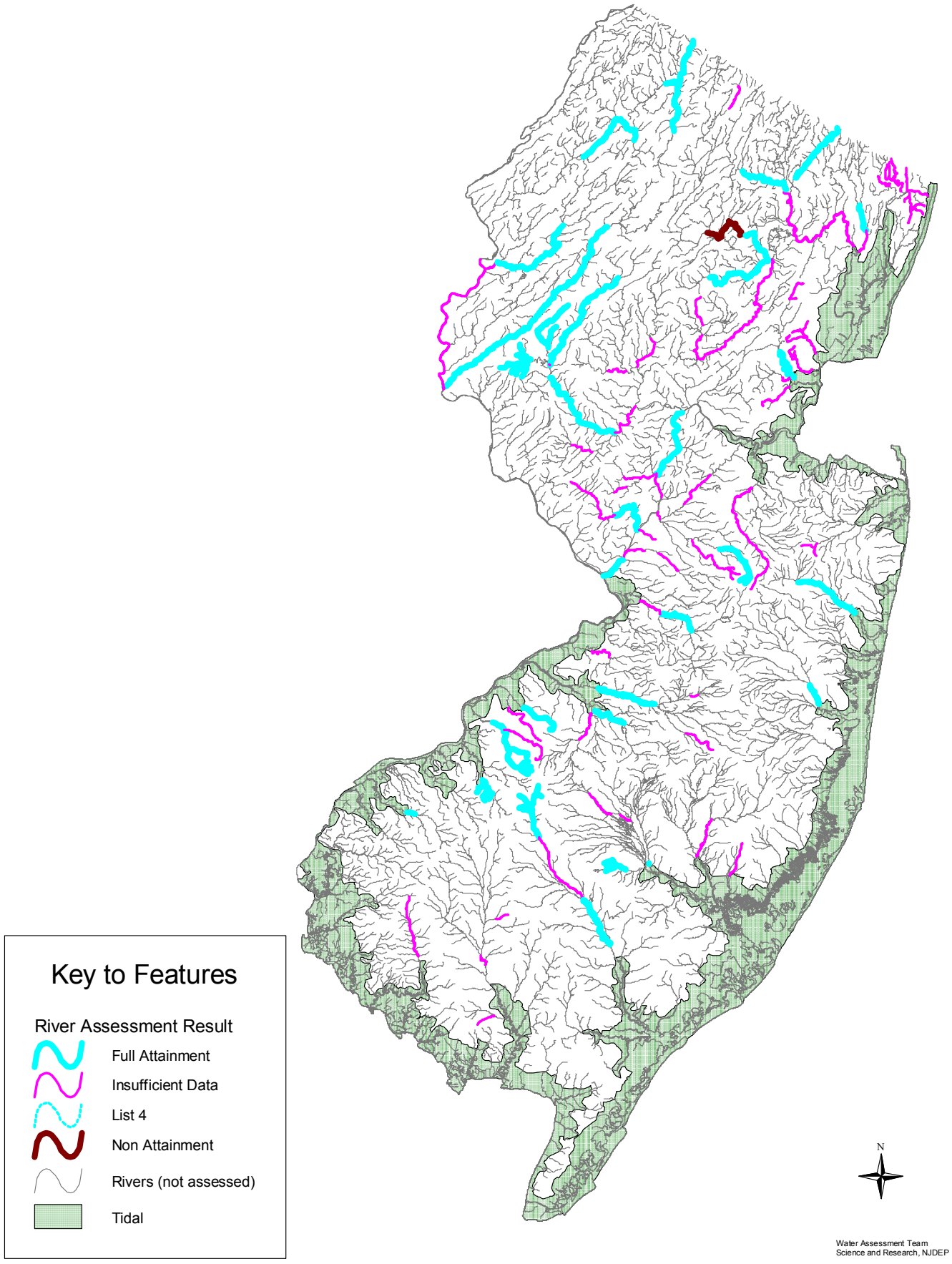


FIGURE 2.1b-19. Assessment Status for Selenium in Rivers.



Silver

A total of 24 sites representing 132 river miles were assessed for silver. Because the acute aquatic life criteria is below the method detection level (MDL), no sites were placed on sublist 1 as "Full Attainment." If the data showed no exceedances, it was listed under sublist 3 as "Insufficient Data." (see the Methods Document, Section 4.2.2 for an explanation of MDLs for metals) However, of the 18 sites on sublist 3, all had insufficient data to make an assessment. Only 25% of the sites were listed on sublist 5, with all of the sites being carried over from the 1998 303(d) List due to insufficient data to make re-assessments.

Results of the silver assessment are summarized below in Table 2.1b-27. Results for individual stations are depicted in Figure 2.1b-20 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-27. Silver Status

Silver Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	0	NA	0	0	NA	NA
Sublist 3	18	75%	84	0	64%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	6	25%	48	0	36%	NA
Totals	24	100%	132	0	100%	NA

Of the 6 stations on the 1998 303(d) List for silver, all of the sites were carried over to sublist 5 due to insufficient data available (see Table 2.1b-28).

Table 2.1b-28. Silver Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name		WMA	Station Number	Station Name
18	01477120, 18-RAC-1	Raccoon Creek near Swedesboro		04	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington		04	01389130, 4-PAS-4	Passaic River at Sigac
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham		04	01389880, 4-SITE-5	Passaic River at Elmwood Park

FIGURE 2.1b-20. Assessment Status of Sites Monitored for Silver. Includes sites carried over from the 1998 303(d) List.

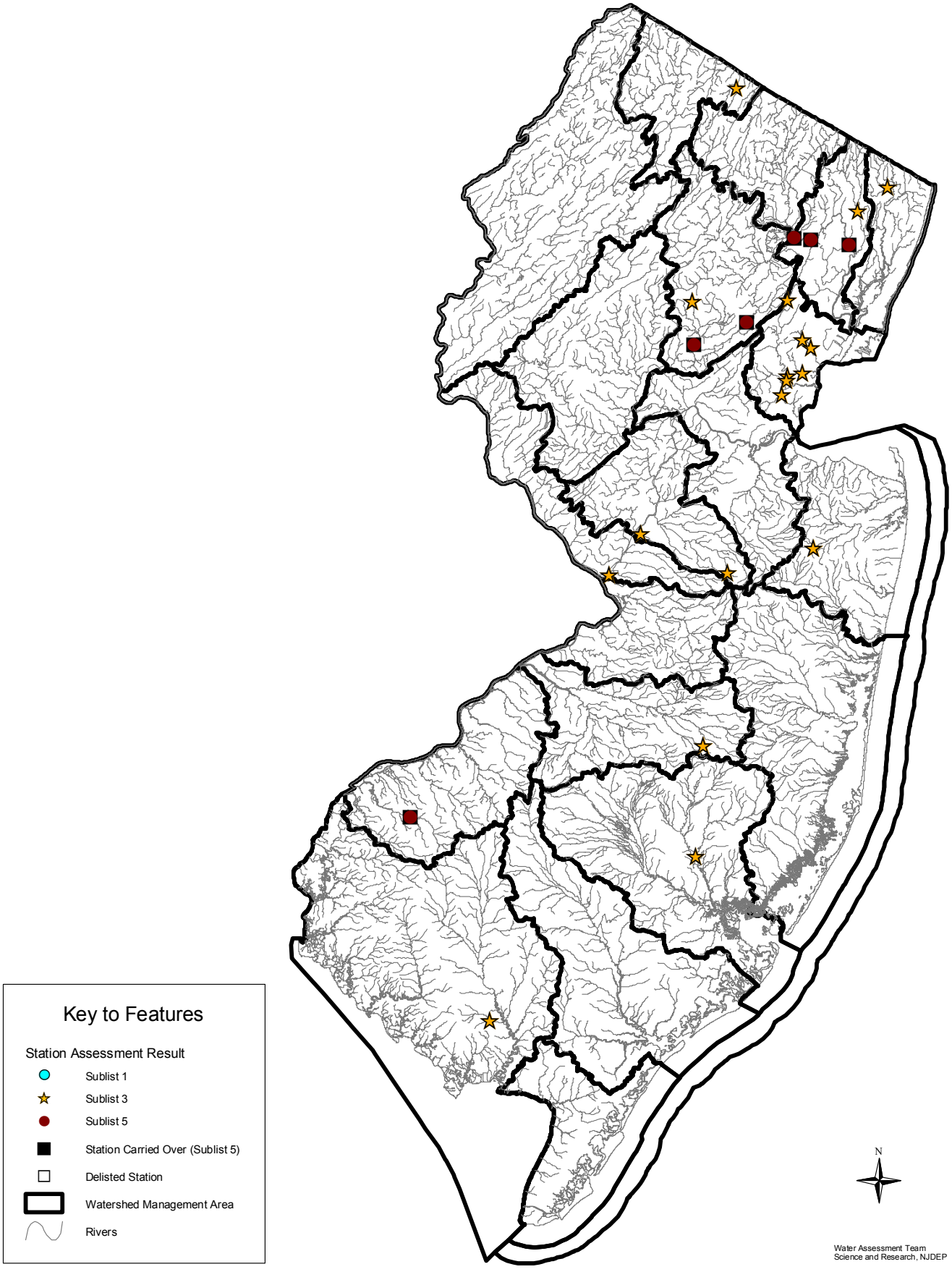
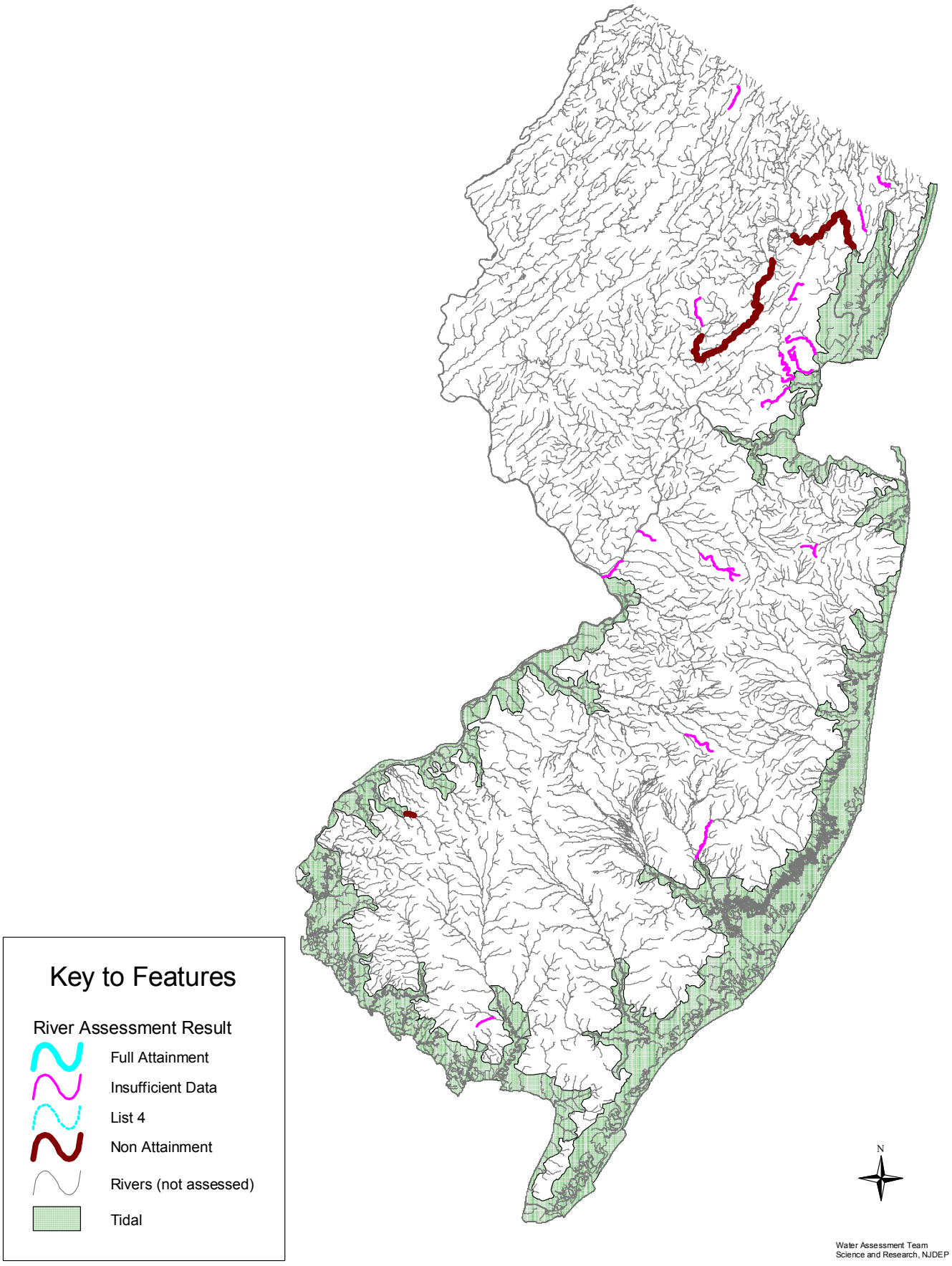


FIGURE 2.1b-21. Assessment Status for Silver in Rivers.



Thallium

Only 9 sites representing 46 river miles were assessed for thallium. All new assessments did not have sufficient data to complete an assessment, while the 3 sites on sublist 5 were carried over from the 1998 303(d) List due to insufficient data to make re-assessments.

Results of the thallium assessment are summarized below in Table 2.1b-29. Results for individual stations are depicted in Figure 2.1b-22 and in Tables II-15 through 18 in the Appendix.

Table 2.1b-29. Thallium Status

Thallium Status	Number of Stations	Percent of Stations	Number of Assessed River Miles		Percent of Assessed River Miles	
			Monitor	Estimate	Monitor	Estimate
Sublist 1	0	NA	0	0	NA	NA
Sublist 3	6	67%	29	0	63%	NA
Sublist 4	0	NA	0	0	NA	NA
Sublist 5	3	33%	17	0	37%	NA
Totals	9	100%	46	0	100%	NA

Of the 3 stations on the 1998 303(d) List for Thallium, all of the sites were carried over to sublist 5 due to insufficient data available (see Table 2.1b-30).

Table 2.1b-30. Thallium Sites Carried Over From 1998 303(d) List

WMA	Station Number	Station Name
06	01389130, 4-PAS-4	Passaic River at Sigac
06	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls
06	01389880, 4-SITE-5	Passaic River at Elmwood Park

FIGURE 2.1b-22. Assessment Status of Sites Monitored for Thallium. Includes sites carried over from the 1998 303(d) List.

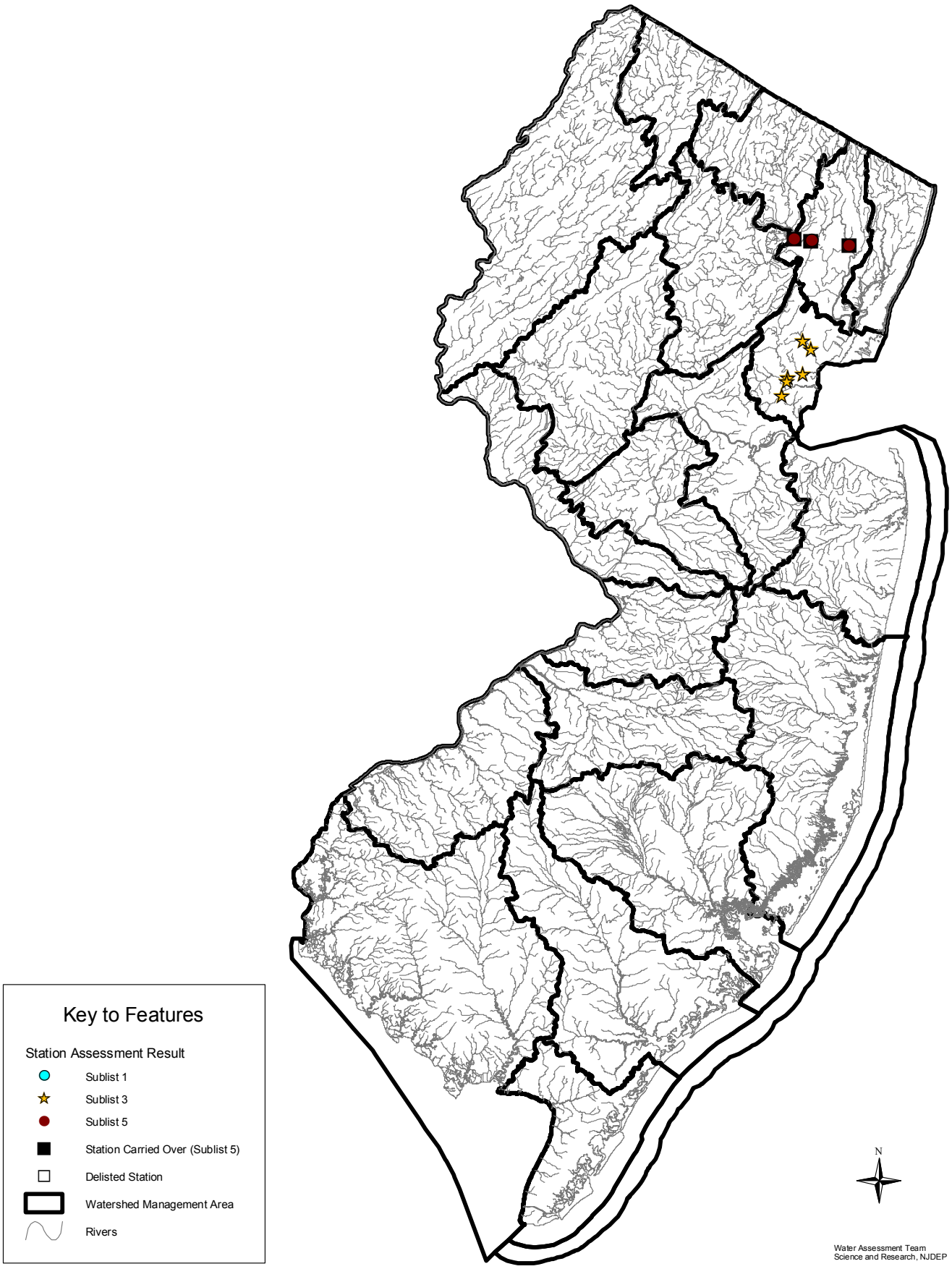
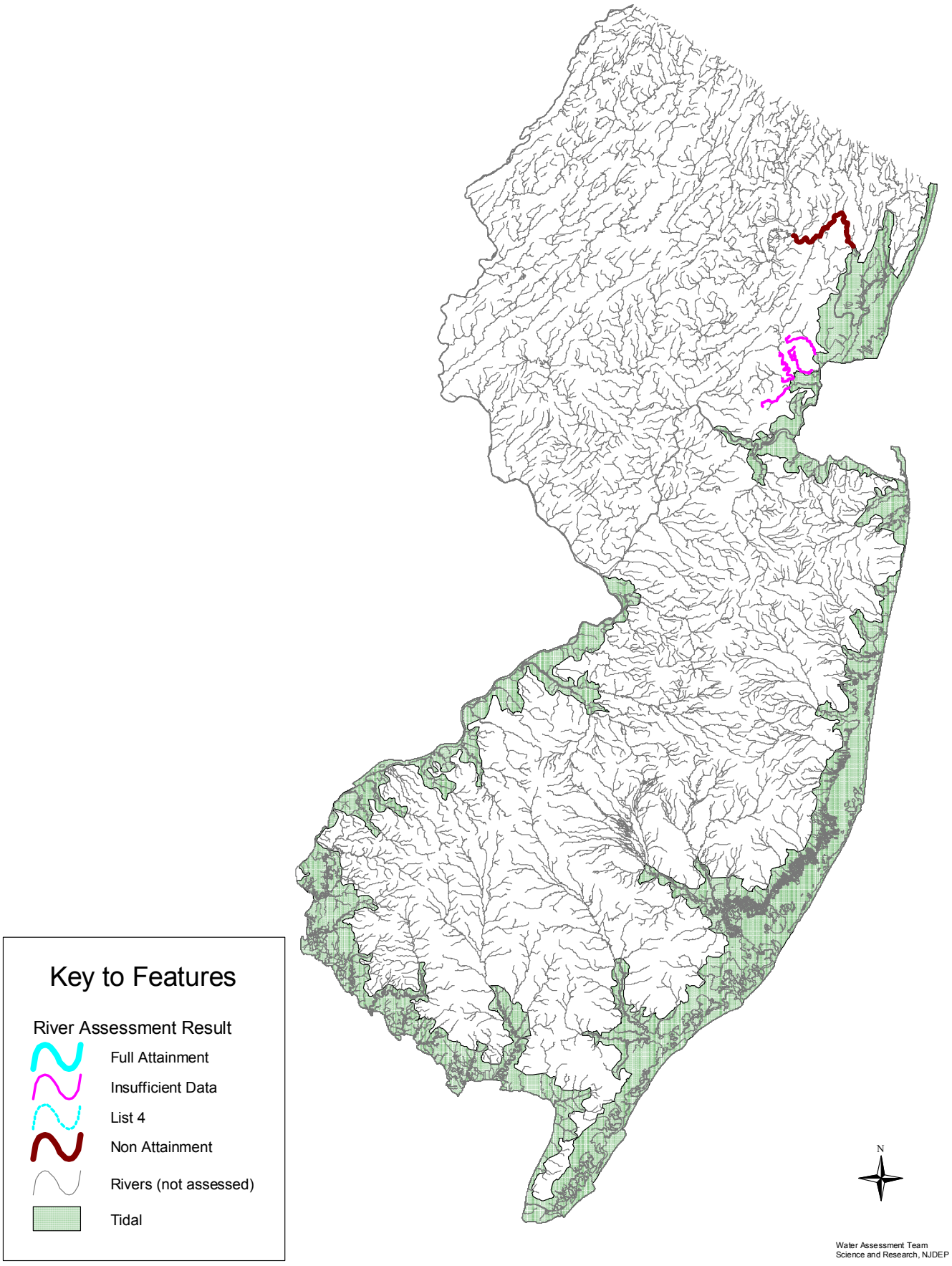


FIGURE 2.1b-23. Assessment Status for Thallium in Rivers.



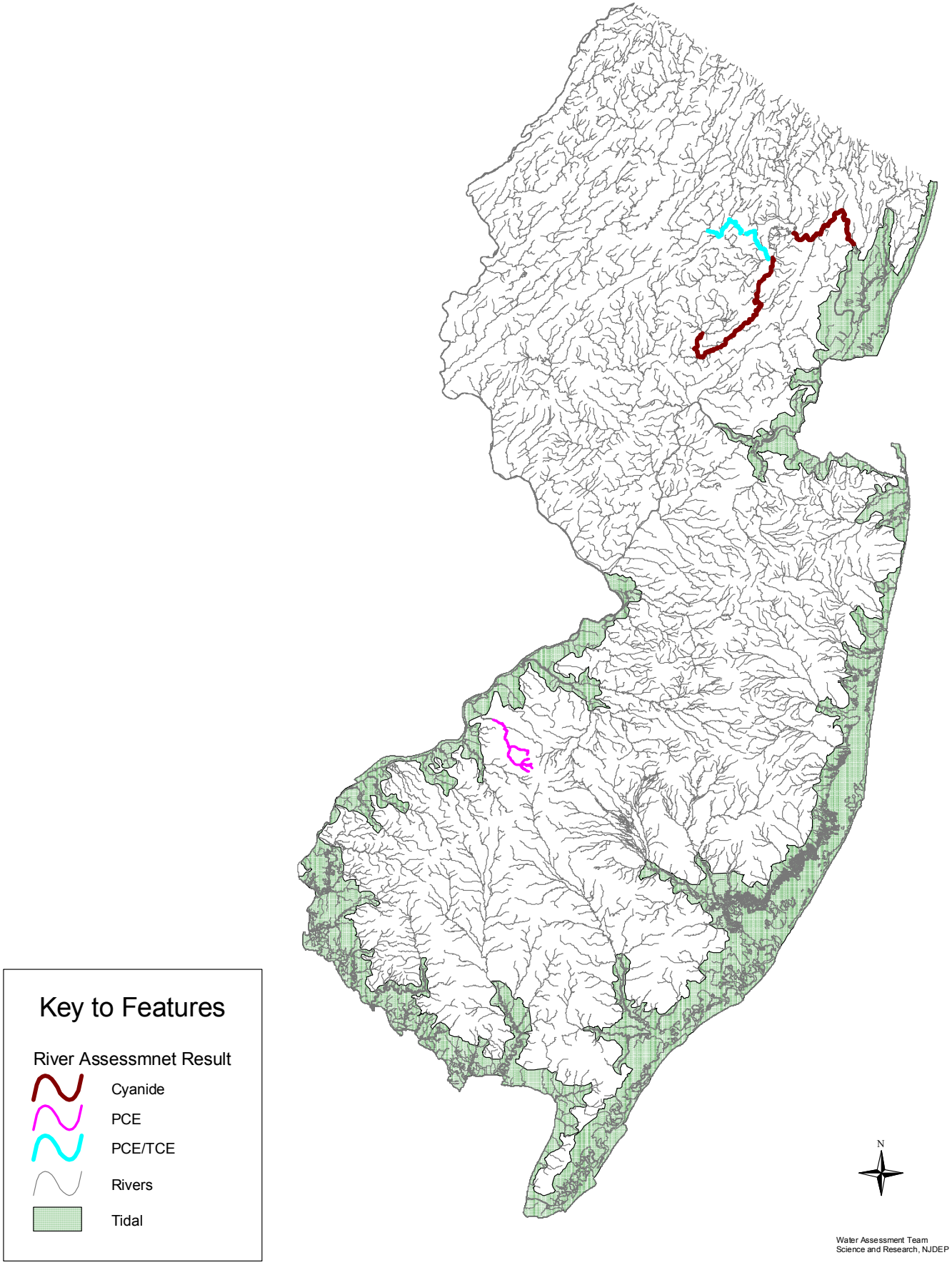
Other Metals

Other metals, not covered in the above section, had exceedances of their criteria that caused them to be listed on the 1998 303(d) List. These sites have no recent additional data to re-assess their status and are listed on sublist 5 of the 2002 Integrated List.

Table 2.1b-31. Other Metals Carried Over From 1998 303(d) List

WMA	Station Number	Station Name	Metal
06	01379000, 6-PAS-1, 6-SITE-2	Passaic River near Millington	Cyanide
06	01379500, 6-PAS-2, 6-SITE-1	Passaic River near Chatham	Cyanide
06	01389130, 4-PAS-4	Passaic River at Sigac	Cyanide
06	01389500, 4-PAS-3, 4-SITE-6	Passaic River at Little Falls	Cyanide
06	01389880, 4-SITE-5	Passaic River at Elmwood Park	Cyanide
08	01467150, 18-CO-4	Cooper River at Haddonfield	PCE
08	18-CO-1	Cooper River at Rte 130 in Camden	PCE
06	01380500, 6-SITE-11	Rockaway River at Boonton	PCE, TCE
06	01381200, 6-ROC-1, 6-SITE-10	Rockaway River at Pine Brook	PCE, TCE

FIGURE 2-1b-24. Other Metals Listed on Sublist 5, Carried Over from the 1998 303(d) List.



Source Assessment for Metals

Although sources of metals may be natural from the weathering of rocks and soils, major sources derive from anthropogenic sources such as wastewater discharges, stormwater runoff, landfills, industrial waste, atmospheric deposition, fertilizers, inorganic pesticides, and automobile exhaust. Many of these metals are found in the streambed sediment of rivers. The metals in the sediments can be an additional source of metals in the water column through re-suspension of the sediments during high flows or by certain physiochemical conditions of the water column.

Unknown Toxics

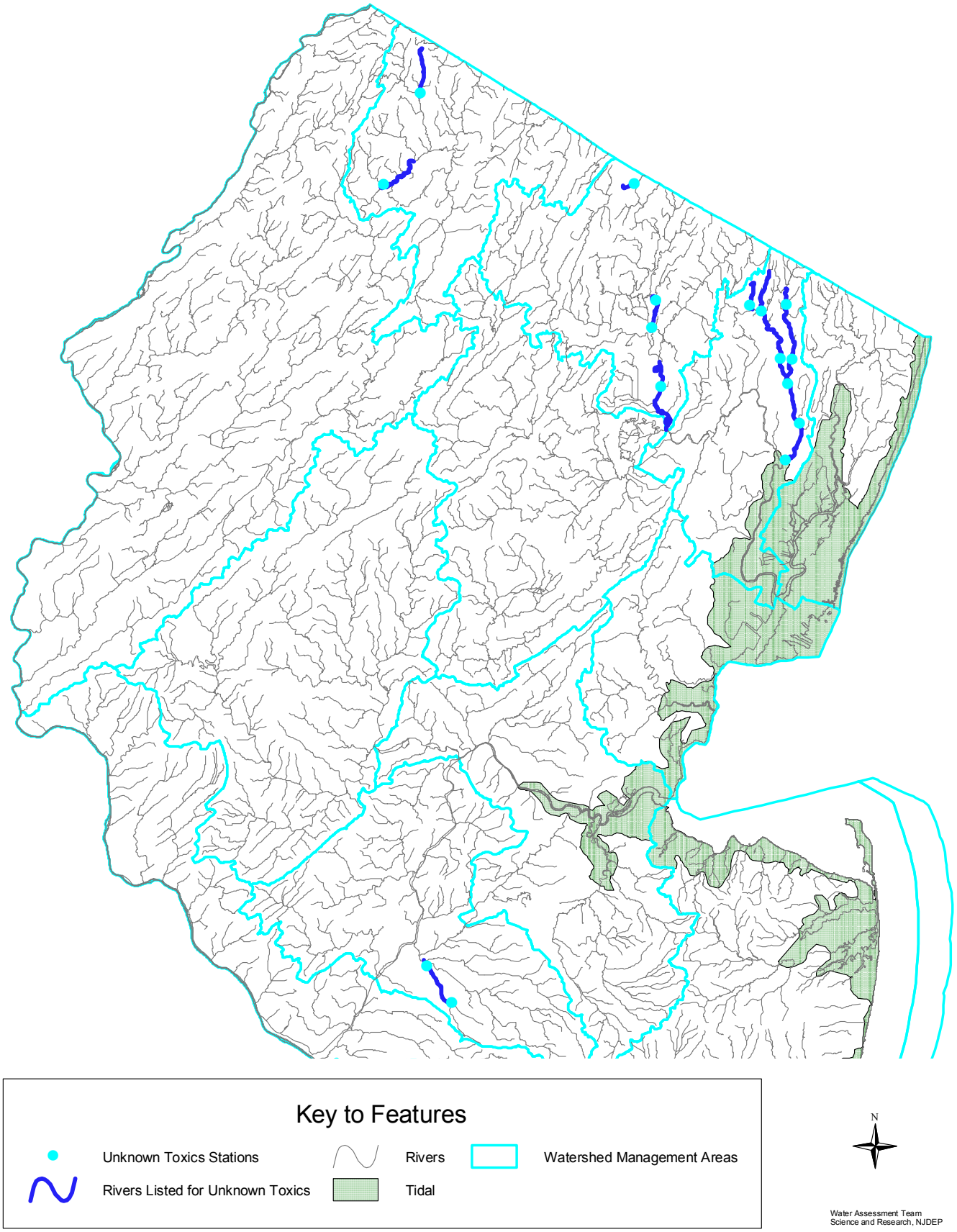
On the 1998 303(d) List, 9 sites representing 54 river miles were listed for unknown toxics (see Table 2.1b-32 and Figure 2-1b-25). These sites were listed as a result of a study that found unusually high abnormalities with macroinvertebrates at NJDEP Ambient Biological Monitoring Network (AMNET) sites. Since the study was conducted, no new sampling has occurred at these sites and they are therefore carried over to sublist 5 of the 2002 Integrated List.

An individual site, Kings Creek, was also listed on the 1998 303(d) List, but was excluded from the assessments since the site could not be located on GIS maps, and river miles could not be calculated.

Table 2.1b-32: Sites with Unknown Toxicity

WMA	Station Number	Station Name
03	AN0255	Wanaque River at E Shore Dr in West Milford Twp
03	AN0256, AN0257	Wanaque River at Highland Ave (blw STP) in Wanaque, Wanaque River at Wanaque Ave in Pompton Lakes
03	AN0268, AN0268A	Pompton R at Newark Pompton Tnpk in Pequannock Twp, Pompton River at Pompton Plains Cross Rd in Pequannock Twp
04	AN0281, AN0282, AN0290, AN0291	Saddle R at E Allendale Ave in Saddle River, Saddle R at E Ridgewood Ave in Paramus, Saddle R at Railroad Ave in Rochelle Park Twp, Saddle R at Marcellus Pl in Garfield,
04	AN0284	Valentine Brook at Forest Ave in Allendale
04	AN0287, AN0288	Ramsey Brook at Park Ave in Allendale, Hohokus Brook at Spring St in Ridgewood Village
02	AN0304	Papakating Creek at Rt 565 in Frankford Twp
02	AN0308	Clove Brook UNK Trib at Rose Marrow Ave in Wantage Twp
20	AN0384	Bear Brook at Stobbe Ln in West WIndsor Twp

FIGURE 2.1b-25. Unknown Toxic Sites.



Section 2.2 Tidal Rivers and Coastal Waters

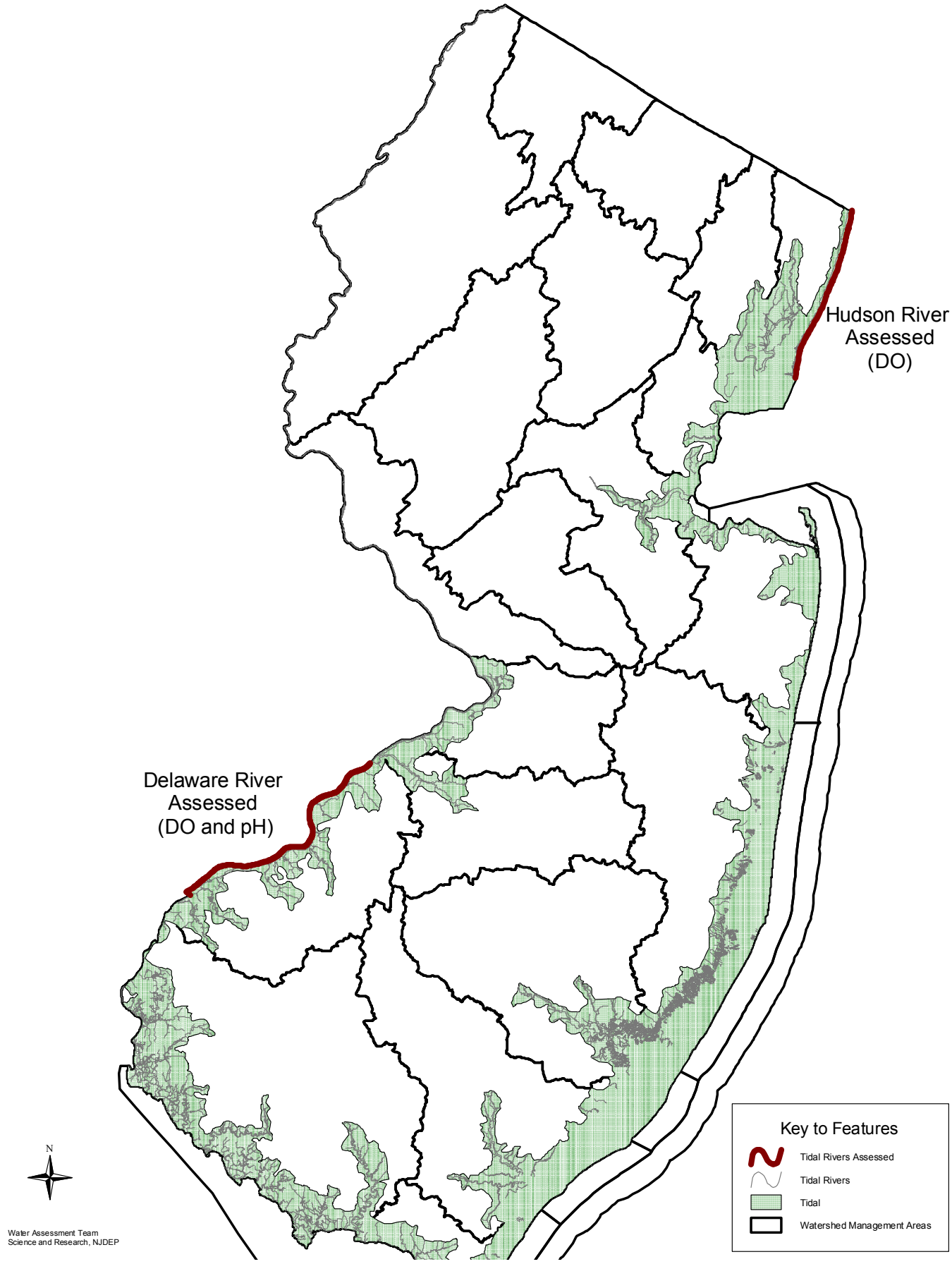
Section 2.2a Conventional Assessments

Of the 1,520 tidal river miles, 152 river miles were assessed for conventional water quality. The primary sources for conventional water quality data include the following networks: Delaware River Basin Commission - Delaware River monitoring; the Interstate Environmental Commission - Hudson River monitoring; NJDEP Marine and Estuarine Water Quality Network- targets mostly coastal waters, but some sites are located in tidal rivers; and Monmouth County Health Department - 23 sites located in tidal rivers with limited data. See Appendix II, Data Sources for the 2002 NJ Integrated Report, for details on the above monitoring networks.

Assessments based on available data included dissolved oxygen (DO), fecal coliform (FC), and pH. Dissolved oxygen and fecal coliform results for tidal rivers are discussed in Chapter 3, Section 3 under aquatic life and recreational designated uses respectively. However, several sites located on the Delaware River and Hudson River, listed on the 1998 303(d) List, are not discussed in Section 3 for DO. These sites were delisted from the 1998 303(d) List after new data confirmed that conditions met SWQS. The spatial extent for these assessed sites may be seen in Figures 2.2a-1. In addition, pH was re-assessed on the Delaware River where it was previously listed on the 1998 303(d) List, and was also delisted.

For coastal water assessments, the two conventional water quality parameters assessed were: dissolved oxygen and fecal coliform. The assessment results for these waters are discussed in Chapter 3, Section 3 under aquatic life and recreational designated uses respectively.

FIGURE 2.2a-1. Tidal Rivers Assessed for Conventional Water Quality. These rivers were not included in the coastal waters assessments in Section 3.



Section 2.2b Metal Assessments

17 sites representing 179 miles were assessed for metals in tidal rivers. While several sites did not have new data for re-assessment, many metals were delisted from the 1998 303(d) List based on recent assessments (See Table 2.2b-1). Of the 91 individual metal listings, 40 metals (44%) were delisted from the 17 sites. In lieu of these delistings, all 179 river miles still had at least one metal on sublist 5. Several sites had metals placed on sublist 4 because of a TMDL or other metal reduction management plans. The sites listed on sublist 4 include: Rancocas Creek at Hainsport - Lead ; Delaware River/Estuary (Trenton to head of Delaware Bay) - 1,2 Dichlorethane and Tetrachloroethene; and Tidal Hackensack River - Nickel. Sites with no new data for re-assessment comprised of: Berrys Creek, Great Egg Harbor River Estuary, Newton Creek, Pennsauken Creek-Mainstem, South River, and Toms River-Tidal.
A summary of metal assessments is shown in Table 2.2b-2.

Table 2.2b-1. Tidal Rivers with Metal Listing

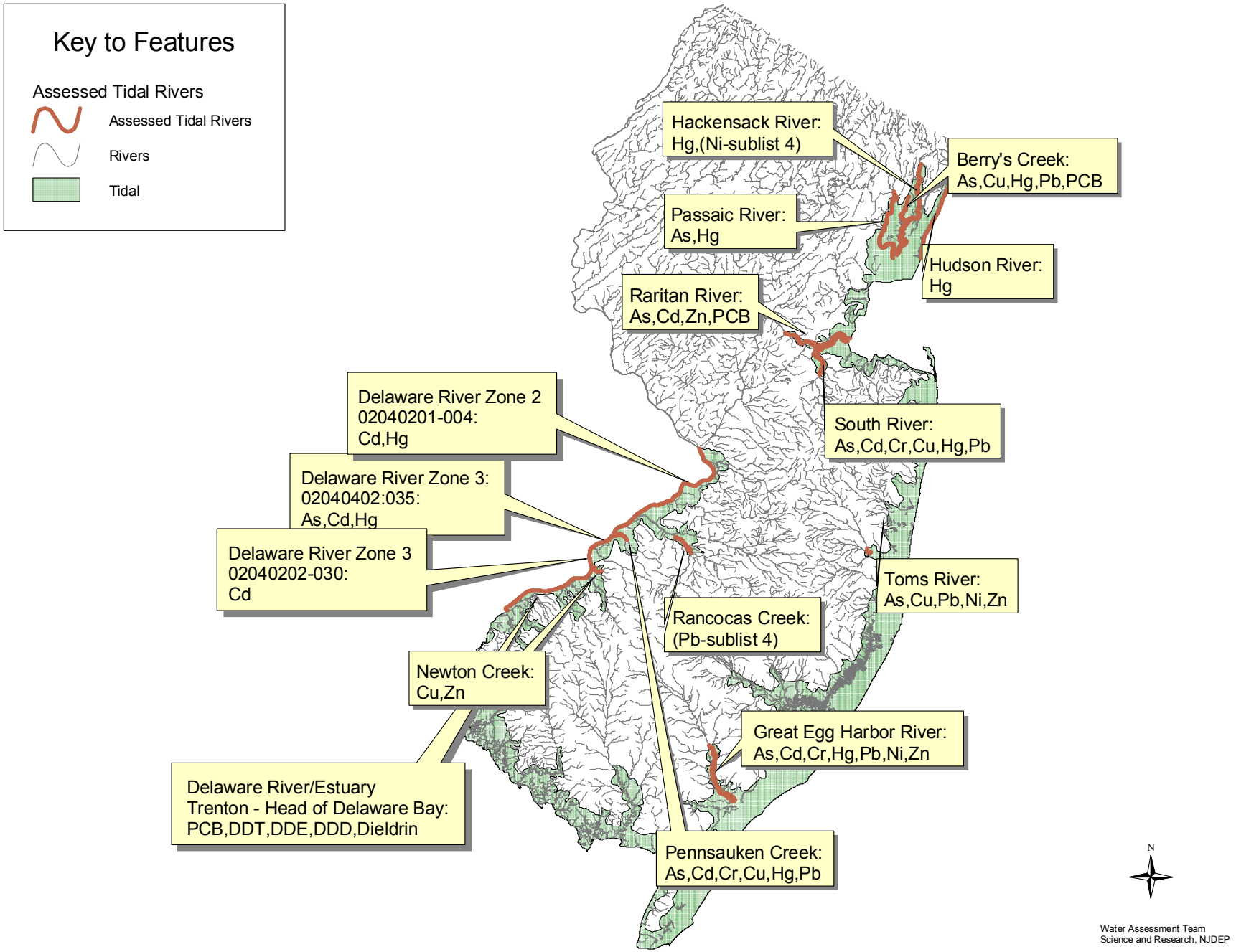
WMA	Station Number	Station Name	Metals Listed on 1998 303(d) List	Metals Listed on Sublist 5 of 2002 Inrtegrated List
19	19-RA-1S	Rancocas Creek at Hainsport	Lead	
05		Berry's Creek Reach 02030103-034	Mercury, Arsenic, Lead, Copper, PCB	Mercury, Arsenic, Lead, Copper, PCB
18/19		Delaware River Zone 2/3, 02040202-043	Copper, Lead, Iron	
19		Delaware River Zone 2, 02040201-004	Arsenic, Berylllium, Cadmium, Copper, Chromium, Lead, Mercury, Silver, Zinc	Cadmium, Mercury
19		Delaware River Zone 2, 02040202-053	Lead, Iron	
18		Delaware River Zone 3 Reach 02040202-030	Cadmium, Copper, Iron, Lead, Zinc	Cadmium
18		Delaware River Zone 3, 02040402-035	Arsenic, Cadmium, Lead, Mercury, Zinc, 1,2-Dichloroethane, Tetrachloroethylene	Arsenic, Cadmium, Mercruy
17-20		Delaware River/Estuary (Trenton to head of Delaware Bay)	PCBs, PAHs, DDT, DDE, DDD, Dieldrin, 1,2 Dichloroethane, Tetrachloroethene	PCB, DDT, DDE, DDD, Dieldrin
15		Great Egg Harbor River Estuary	Arsenic, Beryllium, Cadmium, Chromium, Lead, Mercury, Nickel, Zinc	Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, Zinc
05		Hackensack River – Tidal	Copper, Lead, Nickel	Mercury
05		Hudson River	Mercury	Mercury
18		Newton Creek	Copper, Zinc	Copper, Zinc
04		Passaic River – Tidal	Arsenic, Copper, Lead, Mercury, Nickel	Arsenic, Mercury

Table 2.2b-1. Tidal Rivers with Metal Listing (cont)				
WMA	**Station Number**	**Station Name**	**Metals Listed on 1998 303(d) List**	**Metals Listed on Sublist 5 of 2002 Inrtegrated List**
18		Pennsauken Creek – Mainstem	Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Iron	Arsenic, Cadmium, Chromium, Copper, Lead, Mercury
09		Raritan River Estuary, 02030105-001	Arsenic, Cadmium, Mercury, Lead, Mercury, Zinc	Arsenic, Cadmium, Zinc
09		Raritan River Estuary, 02030105-002	Arsenic, Cadmium, Lead, Mercury, PCB-1254	Arsenic, Cadmium, Zinc, PCB
10		South River	Arsenic, Cadmium, Chromium. Copper, Iron, Lead, Mercury	Arsenic, Cadmium, Chromium. Copper, Lead, Mercury
13		Toms River - Tidal	Arsenic, Copper, Lead, Iron, Nickel, Zinc	Arsenic, Copper, Lead, Nickel, Zinc

Table 2.2b-2. Tidal Rivers Metal Assessments

Metal	Sublist 1: River Miles	Sublist 3: River Miles	Sublist 4: River Miles	Sublist 5: River Miles	Sublist 1: Percent	Sublist 3 Percent	Sublsit 4 Percent	Sublist 5 Percent
Arsenic	18	6	0	75	18%	6%	NA	**76%**
Cadmium	0	6	0	73	NA	8%	NA	**92%**
Chromium	18	6	0	30	33%	11%	NA	**56%**
Mercury	16	6	0	120	11%	4%	NA	**85%**
Copper	84	6	0	25	**73%**	5%	NA	22%
Lead	93	0	5	39	**68%**	NA	4%	28%
Nickel	33	6	24	18	**41%**	7%	30%	22%
Zinc	27	6	0	29	44%	9%	NA	47%
Selenium	0	6	0	0	NA	**100%**	NA	NA
Silver	18	0	0	0	**100%**	NA	NA	NA
PCB	0	0	0	13	NA	NA	NA	**100%**
PCB, DDT, DDE, DDD, Dieldren, 1,2-Dichloroehtane, PCE	0	0	0	55	NA	NA	NA	**100%**

FIGURE 2.2b-1. Assessed Tidal Rivers for Metals. Metals on sublist 5 depicted in text boxes.



Coastal Waters

Of the 1,061 square miles of coastal waters, only 68 square miles were assessed for metals. The only two coastal areas assessed were: Toms River Estuary; and the NY-NJ Harbor comprising of Upper New York Harbor, Kill Van Kull, Newark Bay, Arthur Kill, and Raritan Bay (see Figure 2.2b-2). In the Toms River Estuary, 6 metals were originally listed on the 1998 303(d) list: arsenic, copper, lead, iron, nickel, and zinc. All of these elements have no new data to re-assess their attainment status, however, iron was taken off the 2002 Integrated List since there is no SWQS for this metal. In the NY-NJ Harbor, see Chapter 4, Section 4.2b for a detailed description of the status of metals. No other metal sampling occurred in other coastal waters.

Below is the summary of coastal waters assessed for metals.

Table 2.2b-3. Coastal Waters Metal Assessments

Metal	Sublist 1 Square Miles	Sublist 3 Square Miles	Sublist 4 Square Miles	Sublist 5 Square Miles
Arsenic	0	0	0	3 (Toms R Estuary)
Mercury	50 (Raritan Bay)	0	0	15 (NY-NJ Harbor)
Copper	65 (entire NY-NJ Harbor	0	0	3 (Toms R Estuary)
Lead	65 (entire NY-NJ Harbor	0	0	3 (Toms R Estuary)
Nickel	65 (entire NY-NJ Harbor	0	0	3 (Toms R Estuary)
Zinc	0	0	0	3 (Toms R Estuary)
PCB, Dioxin, PAH, Pesticides	0	0	0	65 (entire NY-NJ Harbor

FIGURE 2.2b-2. Coastal Waters Assessed for Metals.